Proposal for
Green Building Technical Support Services

Submitted to the California Public Utilities Commission

In response to R.01-08-028 2002 Energy Efficiency Program Selection

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Program Overview

Frontier Associates is pleased to submit this proposal to the California Public Utilities Commission for provision of Green Building Technical Support Services. Together with our teaming partner, Austin Energy, we will provide comprehensive consulting services to local governments to initiate or expand their green building or sustainable construction programs.

Green Building programs promote energy- and resource-efficient building design and construction. They incorporate all of the known energy efficiency technologies and practices, but go beyond the narrow consideration of energy at its end use. Green building takes a holistic view of building design and construction by also considering other major energy issues, such as the energy used to deliver clean water; the energy and resources used in the production, transport, use, and disposal of building materials; and the relationships between the building's energy systems and indoor air quality.

Our residential consulting will seek to expand the construction of "green" homes by helping local governments develop educational programs targeting building professionals and homeowners. Our commercial consulting will assist governments in incorporating green design and construction in their own institutional projects, which has value for its intrinsic efficiencies and provides a positive example to stimulate similar practices among the private building industry. For those jurisdictions that are ready to develop a more aggressive green building program that incorporates private-sector commercial projects, we will help them develop educational and incentive programs that accomplish their objectives.

Together, Frontier Associates and Austin Energy form an unparalleled team of professionals with the longest history of field experience in developing green building programs and in implementing them on a mass audience, public level. We have extensive expertise in this field, building on ten years of experience in the development and promotion of green building guidelines on a local level.

All of our team members have a strong experience in green building and the realities of developing, writing, marketing, and implementing guidelines and programs. We strongly emphasize regional appropriateness and developing programs that are designed specifically for the local conditions. We all have many years of field experience and know what building professionals and consumers will and will not accept. Our staff also has equal experience in new construction and remodeling.

The team consists of experienced professionals who have worked the majority of their career in the private sector. The team is composed of staff reflecting the full spectrum of building industry functions, with architects, builders, engineers, marketers, businesspeople, educators, and project managers. Our experience covers residential (low income, speculative, and custom), multi-family, commercial, high-tech, and institutional. Some members of our team have spent many years working in construction and green building in California.

Program Proposal Summary

Program Name	Green Building Technical Support Services
Program Category	Local Cross-Cutting Program – Education/ Training/ Outreach
Budget	$593,666 from PG&E electric PGC funds
Performance Targets	Provide technical support services to five local governments
Program Strategies	Upstream information program
Target Market Segments	Residential New Construction Nonresidential New Construction

Program Rationale

Our proposal targets new construction since, as a general rule, incorporating energy and resource efficiency into the design and construction of a new building is more effective than retrofitting a building after construction. The green building community is increasingly embracing three guiding principles to new construction program design:

1. An integrated whole-building systems approach to design and construction will always produce substantially better results than a more narrowly focused measure approach. When building team members come together at the very start of the project to coordinate functions, set specific project goals, and then work in a coordinated fashion towards achieving those goals, the project will be designed better, reduce change orders, save construction costs, and result in a higher quality building.

2. A holistic approach that considers *all* energy impacts related to design and construction (energy, water, indoor environmental quality, and materials) will produce greater benefits to the building owner and the greater community than efforts to address energy use in the typical narrow scope.

3. To encourage innovation, voluntary, rewards-based initiatives are required. Punitive approaches (e.g., building codes and equipment standards) are necessary at times to set a minimum and cement the role of widely adopted design and construction methods as standard practice. However, they are of little use in promoting the development and adoption of innovative practices.

This program will help local jurisdictions establish guidelines that facilitate strong building professional and homeowner participation.

Market Barriers

Local governments (cities and counties) are logical agents for promoting innovative design and construction practices that improve building resource efficiency and construction quality. They already work closely with construction project developers to ensure that the resulting building will satisfy societal criteria for health and safety and will be consistent with community values for building design and land use, as expressed in the agency's General Plan, Building Code, and other planning policies. However,

local governments face significant constraints in funding, staffing, expertise, and other resources needed to aggressively promote best practices within the local construction community.

Program Response

This program will provide the necessary technical resources for interested local governments to expand their existing green building initiatives or implement new initiatives. The program will help governments:

- Develop educational resources to train building designers and construction contractors on state-of-the-art green building practices
- Develop rewards-based mechanisms to encourage the building and design community to adopt these practices
- Develop design guidelines and other resources to govern eligibility for these rewards
- Implement the guidelines
- Develop mechanisms to enroll builders and developers into the programs and to educate homeowners about the benefits of purchasing green homes

The program will incorporate elements that promote the conservation of energy, water, and construction materials in ways that are consistent with public health and safety and other considerations. The program will address both residential and nonresidential new construction.

Objectives

The Green Building Technical Support Services objective is to transfer green building technical expertise and resources to participating local governments. We intend to work with interested Bay Area cities and counties to assist them in adopting and promoting more sustainable construction practices. Specific services will be tailored to the needs of each jurisdiction but will be geared towards developing programs or projects which are consistent or compatible with the efforts of the other Bay Area jurisdictions.

The objective of this program is *not* to provide ongoing, subsidized green building program delivery services on behalf of participating agencies. Thus, one challenge will be to assist governments in developing in-house programs that can be implemented within the constraints of available agency staffing and financial resources.

Program Process

Marketing and Outreach Plans

The program will direct its outreach efforts to nine Bay Area counties and 100 Bay Area cities and towns. We have already made preliminary contact with appropriate staff from a majority of the counties and many of the larger cities and have found strong support for such a program. A few agencies have contributed letters of support, which are attached in Appendix A.

Once the Green Building Technical Support Services program receives funding, we will continue outreach efforts, focusing first on county governments. We will solicit both direct county involvement in the program and references to cities within the county that are good candidates to benefit from program services. We will also directly approach those cities experiencing high rates of construction activity, since they would particularly benefit from developing or enhancing a green building program.

Finally, we will solicit active involvement from the Association of Bay Area Governments (ABAG). ABAG is a regional planning agency established to address regional issues in areas such as land use, housing, environmental quality, and economic development. ABAG is owned and operated by the cities and counties of the San Francisco Bay Area. As such, it represents an ideal forum, not only for initial outreach and marketing efforts to specific agencies, but also for more general communication and education initiatives to the full ABAG membership. Through ABAG, we hope to coordinate with several ongoing regional initiatives, including the Bay Area Alliance for Sustainable Development and the Green Business Program.

The Bay Area Alliance for Sustainable Development is a multi-stakeholder coalition established in 1997 to develop and implement an action plan that will lead to a more sustainable region. The Alliance provides a forum to address the region's inter-related needs for a prosperous economy, quality environment, and social equity. The members of the Bay Area Alliance are constituency-based public and private sector organizations, as well as the civic, philanthropic and faith communities. William Carroll, ABAG President, serves on the five-member Alliance steering committee. Together, the member agencies have adopted Ten Commitments to Action, which includes the commitment to use resources efficiently, eliminate pollution, and significantly reduce waste. Green Building Technical Support Services will contribute directly to this goal.

ABAG coordinates the Green Business Program, which is a successful voluntary partnership of government agencies, professional associations, utilities, businesses and a concerned public. Participants work together to assist, recognize, and patronize businesses that operate in an environmentally responsible way. The Program helps businesses comply with environmental regulations, and then go beyond compliance to conserve energy, water and other resources, and to reduce pollution and waste. The program currently operates in Alameda, Contra Costa, Napa, Santa Clara, and Sonoma

Counties. This program may prove to be a useful channel for acknowledging businesses that adopt green building practices in their capital improvement projects.

Enrollment Process

Participants in this program will be local governments in the Bay Area. Frontier and Austin Energy program staff will meet with government staff to explore the agency's needs for technical assistance and the program's ability to satisfy those needs. This meeting will lead to a mutually agreeable set of services the program will provide, which will be formalized through a letter agreement. These services will be tailored to complement the agency's existing and planned program activities, including any technical support the agency is receiving from other entities. Since the program focus is to transfer technical expertise and resources to the local government, a commitment of agency staff time is a prerequisite for receiving these services.

As part of participation in the program, we will ask local governments to participate in a program advisory committee. The committee will provide a forum for exchanging information and experiences, discussing common issues, identifying common needs, and allocating program resources to participating governments in an equitable manner.

Services to be Provided

As our program design starting point for residential buildings, we will use the Alameda County Waste Management Authority's (ACWMA) residential green building guidelines (see Appendix F and www.stopwaste.org/fsbuild.html). These guidelines were well developed by a collaborative effort of the ACWMA, local building professionals, and national green building experts to specifically suit Bay Area conditions. The guidelines are presently being implemented in Alameda County with great success. It is our intention to assist city and county governments in other Bay Area counties in adopting these same or similar guidelines in their local jurisdictions. Doing so will provide a degree of program uniformity across jurisdictions that facilitates support and participation from the construction industry. Our team has spoken with ACWMA staff and they have agreed that we can use their guidelines in other Bay Area Counties. ACWMA accepts no liability for the use of these guidelines in any juridiction outside of Alameda County.

Our program starting point for commercial buildings will be the U.S. Green Building Council's (USGBC) LEED™ commercial guidelines and rating system (see Appendix G or www.usgbc.org). LEED has been funded and strongly supported by the U. S. Department of Energy and the U. S. Environmental Protection Agency as the best developed criteria to evaluate green commercial buildings. In fact, numerous federal, state, and local governments feel that the benefits of building to the LEED criteria are so great that they require that all of their institutional buildings meet the criteria. Additionally, the California Energy Commission is presently completing a set of modified LEED criteria to suit the California market specifically. We will promote these criteria through this program. When appropriate, we will also supplement both

commercial and residential guidelines with Austin Energy Green Building Program elements, tailored to local conditions.

For budgeting purposes, we have assumed we will provide intensive and tailored technical support services to a total of five cities and/or counties. We will work with local government staff to identify and prioritize green building activities the agency would like to accomplish, for which outside technical support and resources are necessary. Interactions with several county program managers have already indicated at least one key area. In those counties that have active green building programs, Green Building Technical Support Services will help county staff transfer that expertise to city staff interested in pursuing analogous initiatives at the local level.

Possible program services and focus areas include:

- Program development
- Training seminars and workshops
- Demonstration projects
- Recommendations on improved marketing and educational strategies/tactics
- Development or refinement of sustainability guidelines, sourcebooks, manuals, specifications, rating systems and fact sheets
- Building commissioning guidelines
- Development of improved brochures, advertisements, publications, and web site
- Development of training materials and training of staff on technical issues and implementation strategies
- Project design and specifications review
- Energy analysis/modeling
- Program evaluation

In addition to tailored, agency-specific technical support services, we have reserved ten percent of the program budget for more general educational activities. These activities may serve private sector builders, developers, architects, and engineers, along with some or all local governments in the Bay Area. Anticipated educational channels include training seminars and workshops, meeting presentations, and electronic and print media channels.

Coordination with Other Programs

We will coordinate with existing green building programs the various cities and counties in the region have already begun to implement. Our services are not intended to supplant existing initiatives. Rather, this program will complement existing efforts to improve the quality of Bay Area design and construction practices. It is our intention to advise and assist Bay Area governments in improving existing efforts or, when appropriate, developing new efforts. Although our primary clients will be local

governments, we will, to the best of our ability, work with any and all parties who have the common goals of improving the sustainability of Bay Area building practices.

We will coordinate with existing new construction programs. We will assist local governments in providing technical assistance to those projects that wish to qualify for incentives through either the residential California ENERGY STAR® New Homes or the nonresidential Savings by Design programs. To the extent possible, we will also help them obtain incentives from water conservation and resource conservation programs.

Customer Eligibility

Targeted Customers

Targeted customers for this program include the nine counties in the San Francisco Bay Area and the 100 cities that are located in those counties. The residential target for our program will not include Alameda County jurisdictions, since ACWMA already offers a program to this market.

Customer Sizes Targeted

There is no limitation on the size of the city or county.

Geographic Area

The nine-county Bay Area includes Alameda, Contra Costa, Solano, Napa, Sonoma, Marin, San Francisco, San Mateo, and Santa Clara counties.

Program Performance Goals

The program will provide intensive and tailored technical support services to a minimum of five cities and/or counties. For each participating jurisdiction, we will prepare a letter agreement that includes a scope of work, budget, and jurisdiction-specific performance goals. These letter agreements will be presented to the administrating utility and/or PUC staff for review and approval prior to being finalized.

Evaluation Plans

We will hire a third-party evaluator for this program. Evaluator selection will be subject to approval by the utility administrator.

Evaluation Objectives

Program evaluation will address the following objectives:

- Provide up-front market assessments and baseline analysis
- Provide ongoing feedback, and corrective and constructive guidance regarding the implementation of programs
- Measure indicators of the effectiveness of specific programs, including testing of the assumptions that underlie the program theory and approach
- Help to assess whether there is a continuing need for the program.

Approach to Evaluating Program Success

Evaluation activities will focus on reviewing program documentation and interviewing participating local government staff and others with detailed knowledge of program activities. The focus of these activities will be to address the four evaluation objectives, as described below.

Market assessments and baseline analysis

A market assessment and baseline analysis will be conducted as part of the implementation plan. The market assessment will consist of a brief overview of the status of green building programs throughout the nation. The baseline analysis will catalog major green building initiatives in the Bay Area.

Ongoing program implementation feedback

Midway through program implementation, the program evaluator will conduct a series of interviews with participating local government staff and others with detailed knowledge of program activities. These interviews will elicit feedback on the strengths and weaknesses of program design and implementation, which will form the basis for a series of recommendations for improving program delivery.

Measure indicators of program effectiveness

Letter agreements with participating local governments will specify indicators of program effectiveness that reflect the specific services anticipated. Evaluation activities will be refined to measure these indicators at that time.

Assessment of continuing program need

The benchmark for determining the need for continuing the program will be the degree to which participating local governments are equipped with the in-house knowledge base and information resources to manage their green building programs. Measures of this benchmark will be incorporated in interviews with government staff.

Budget

Proposed Funding Category

This proposal is submitted as a Local Cross-Cutting Program: Education/ Training/ Outreach with a total budget of $593,666, including five percent for contract administration, to come from PG&E electric PGC funds.

Budget Summary

Reporting costs include the cost of developing an implementation plan, six quarterly reports, and one final report.

Travel expenses assume a total of 17 trips from Austin to the Bay Area at $1,000 each for air fare, lodging, car rental, and per diem. It also assumes local staff travel 150 miles per month at $0.35 per mile.

Marketing and outreach costs incorporate staff time to make initial contact with local governments and time to develop and finalize five letter agreements with participating agencies. It also includes $50,000 for general education activities.

Direct implementation costs reflect the assumptions that Frontier staff will spend 24 hours per month providing services, for a total of 504 staff hours. Austin Energy staff will spend 120 hours per month providing services, for a total of 2,520 staff hours.

Budget

	First Year Cost	Second Year Cost	Total Cost
Administrative Costs			
Program Manager	$6,480	$8,640	$15,120
Adminstrative Support	$2,520	$3,360	$5,880
Travel expense by direct & indirect labor	$7,758	$10,344	$18,103
Reporting	$6,600	$7,200	$13,800
Miscellenous	$2,267	$3,023	$5,290
Total Frontier Administrative Costs	**$25,625**	**$32,567**	**$58,193**
Marketing/Advertising/Outreach Costs			
Total Marketing/Advertising/Outreach Costs	**$31,200**	**$50,000**	**$81,200**
Direct Implementation Costs			
Frontier labor	$21,600	$28,800	$50,400
Austin Energy labor	$108,000	$144,000	$252,000
Other subcontractors	$21,600	$28,800	$50,400
Materials and supplies	$4,286	$5,714	$10,000
Miscellaneous	$15,549	$20,731	$36,280
Total Direct Implementation Costs	**$171,034**	**$228,046**	**$399,080**
Evaluation, Measurement and Verification Costs			
Total EM&V Costs	**$0**	**$26,924**	**$26,924**
Total Frontier/ Austin Energy Budget	**$227,860**	**$337,537**	**$565,396**
Contract Administration	**$11,393**	**$16,877**	**$28,270**
TOTAL BUDGET	**$239,253**	**$354,413**	**$593,666**

Corporate Qualifications and Staffing

Primary Implementer

For this project, Frontier Associates will provide project coordination, contract administration, and program reporting. The firm brings to the project broad experience with all facets of energy efficiency program design, implementation, and evaluation.

Established in 1999, Frontier quickly became the leading energy efficiency consultant to investor-owned utilities in Texas. Now, throughout the country, Frontier is an important consultant to electricity retailers, electricity distribution companies, power generators, natural gas distributors, electricity and gas consumers and manufacturers of energy efficiency related products.

Frontier's growth and success is founded on our unparalleled knowledge of market and regulatory issues facing utility companies, business and industry, regulatory bodies, all levels of government, and consumers, as evidenced by our diverse client base and professional staff. Frontier Associates delivers its consulting expertise to clients in each sector of the energy industry:

- **Utilities:** Frontier Associates works with electric and gas utilities and the Public Utility Commission of Texas on a variety of topical areas including sales and marketing, program design and evaluation, and pricing. Our capabilities are well suited to either the regulated or competitive side of today's utility business.
- **Commercial and Industrial Customers:** Frontier Associates provides a broad range of energy use and procurement services to its C&I clients, ranging from load profiling to pricing options to developing bids into utility or state sponsored efficiency projects.
- **Allied Industries:** Manufacturers, distributors and retailers are affected by a number of utility and regulatory initiatives to promote higher efficiency products. Frontier Associates provides consulting services to allied industry clients on how to prosper through participation in these programs.

Subcontractors

For this project, Austin Energy will provide a large bulk of the green building technical consulting services. The firm brings to the project extensive experience with all facets of effective green building program design, implementation, and evaluation.

The mission of Austin Energy's Green Building Program over the past ten years has been to accelerate the integration of sustainable building products and practices with mainstream building through marketing, education, and technology transfer. We encourage construction professionals and consumers to incorporate sustainable building practices, systems, and materials into residential, multi-family, commercial,

municipal/institutional, and affordable housing, all within new and retrofit construction. Our success is due to the fact that we are promoting "win-win" propositions: improved building quality, reductions in utility bills, reduced maintenance costs, improved indoor air quality, and resource conservation. This positive, market-oriented approach brings interested buyers and informed building professionals together, stimulating voluntary improvements and maintaining a working relationship between the building industry, utility, and municipal government, while increasing the overall understanding of the public on the issues of sustainable community development.

The Green Building Program staff is recognized internationally for expertise in "green" construction. The background of our team is made up of the full spectrum participants in the building industry with architects, builders, engineers, government policy-makers, marketers, businesspeople, educators, project managers, and also consumers. Our experience covers residential (affordable, speculative, and custom), multi-family, commercial, high-tech, and institutional. All of our team members have strong experience in the realities of developing, writing, marketing, and implementing guidelines and programs effectively. We strongly emphasize regional appropriateness and developing educational efforts that are designed specifically for the local conditions. We all have many years of field experience and know what building professionals and consumers will and will not accept. We offer a unique and highly qualified team with a broad range of talents.

Both Frontier Associates and Austin Energy enjoy excellent relations with a pool of experienced and specialized green building subcontractors, which we can call upon fairly quickly to add any needed skills or services to this program.

Personnel

Frontier Staff

Bill Brooks, Chief Executive Officer. Mr. Brooks has become a leading energy efficiency resource for many of the major utilities in the Southwest. His recommendations have resulted in annual savings of millions of kilowatt-hours of electricity for utility customers throughout the United States. He is responsible for marketing and energy efficiency program consulting services to electric and gas utilities including product development, screening and selection, marketing/business plan development, regulatory impact analysis, corporate strategic fit analysis, program evaluations, and monitoring and evaluation services.

Prior to joining Frontier, Mr. Brooks was VP and Managing Director-Consulting for Planergy, one of the largest energy services firms in the US, where he advised utility clients on energy efficiency and renewable energy program design. He has also worked for Gulf States Utilities Company as Commercial Marketing Administrator and as Supervisor - Customer Services responsible for defining program objectives, assessing market potential, selecting appropriate technologies, and implementing promotional activities to achieve objectives. He has directed market research and end-use metering

projects supporting utility programs, testified on efficiency and renewable energy programs and provided regulatory support for related utility filings.

Mr. Brooks has presented testimony before City Councils, Texas Senate and House Committees and before the Public Utility Commission of Texas. Mr. Brooks earned his Bachelor of Business Administration degree at the University of Texas at Austin and completed post-graduate work at Lamar University, Beaumont, Texas.

Jay Zarnikau, Ph.D., President. Dr. Zarnikau has pioneered the development of new pricing strategies for electric and water utilities, and contributed to significant advances in the state-of-the-art in utility planning. He has also assisted large industrial energy consumers in rate negotiations and energy procurement activities.

Dr. Zarnikau is responsible for providing assistance in the design and implementation of energy efficiency programs and consulting assistance in the areas of utility resource planning, electricity pricing, rate analysis/design, program evaluation, demand forecasting, and energy policy.

Dr. Zarnikau formerly served as the Manager of the Energy Strategies Research Program at the University of Texas at Austin Center for Energy Studies, where he supervised and conducted research on energy pricing, planning, and policy issues.

For over seven years, Dr. Zarnikau was with the Public Utility Commission of Texas, holding various positions, including Director of Electric Utility Regulation, supervising staff activities and preparing and defending testimony in numerous proceedings on topics including load forecasting, rate design, cogeneration, system planning, demand-side management program impacts, billing determinants, wheeling, and computer modeling.

Mr. Zarnikau earned his Bachelor of Business Administration and Economics at State University of New York. He then went on to earn his Ph.D. and M.A. in Economics at the University of Texas at Austin, Austin, Texas. His publications include articles in The Energy Journal, Resource and Energy Economics, IEEE Transactions on Power Systems, and The Electricity Journal.

Bruce Mast, Senior Associate. At Frontier, Mr. Mast contributes key technical expertise for marketing and energy efficiency program consulting services to electric and gas utilities including market research, competitive assessment, product development, forecasting, marketing/business plan development, and monitoring and evaluation services. Mr. Mast has emerged as a leading advocate for integrating diffusion of innovation concepts into conventional utility evaluation and forecasting methods. This approach incorporates key concepts from economics and communications theory to better understand customer responses to energy efficiency programs and new product commercialization.

Prior to joining Frontier, Mr. Mast was VP at Pacific Consulting Services, where he directed all facets of market research and program evaluation activities. In this capacity, he directed development of recommendations to harness market forces to improve

energy efficiency in California's new construction industry. He also authored a major portion of a report reviewing and summarizing fourteen groundbreaking market effects studies in California. His market research activities extended from construction practices to evaporative cooling technologies to residential light fixtures. His program evaluation activities covered the spectrum, from new construction to retrofit, from impact to process evaluation, from residential to commercial and industrial, from incentives to information programs. As a project manager, he directed data collection and analysis activities associated with phone and mail surveys, focus groups, and mystery shopper visits.

Mr. Mast also brings to the project extensive local government experience, having served on the Albany City Council from 1994 to 1998. During that time, he initiated and chaired a community process to formulate the City's Youth Master Plan and represented Albany on the Alameda County Congestion Management Agency. In his final year on the Council, Mr. Mast served as Mayor and guided reconstruction of public facilities in the city's primary retail corridor. Mr. Mast earned his Bachelor of Arts degree in physics at Rice University, Houston, Texas.

Philip Audet, Senior Associate. Mr. Audet is a leading national resource on mass market energy efficiency programs, program administration and appliance energy efficiency. He has established and managed projects that have resulted in the installation hundreds of thousands of energy efficient appliances. Mr. Audet has extensive experience with all aspect of residential, low-income and commercial and industrial energy efficiency implementation projects.

Mr. Audet is responsible for standard offer program design support, marketing plan development and consulting services related to field services delivered by utilities and their contractors. He has participated in development of deemed savings values for Texas' statewide standard offer program development and has worked on the design of a residential/small commercial standard offer program. Mr. Audet is providing marketing support for new product development for a product development consortium.

At Planergy, Inc., Mr. Audet was responsible for the business development and operations management of Planergy's Field Services Division, which comprised 80-90% of the Company's revenues and employees. Responsibilities included the management of Planergy offices in eight states.

Mr. Audet earned his Bachelor's degree in Chemistry at Holy Cross College, Worcester, Massachusetts.

Austin Energy Staff

Richard Morgan, Program Manager. Mr. Morgan directs the Austin Energy Green Building Program, its staff of fifteen experts and an annual budget of $1.5 million. His concentration is on education, affordability, buildability, new construction, remodeling, and green and energy-efficient systems and practices. Mr. Morgan's 28 years of experience in the construction industry, including five years as a CA licensed general

contractor (CA Lic. # 587401) adds valuable hands-on and regional experience to this team.

Marc Richmond, Project Manager. Mr. Richmond coordinates the Green Building Program's residential green building section educating builders and homeowners on the specifics of building green homes. In addition, he coordinates the Program's consulting division working with cities and utilities to develop and improve their own green building programs. His concentration is on designing green guidelines and programs that are understandable and buildable for professionals, understood to be valuable by consumers, and have all of the necessary elements and partnerships to work in the field in the long term. He highly values clear guidelines, good writing, and effective marketing. His experience as a builder, policy-maker and as a businessperson makes him focus on simple, effective solutions that will make the target audience take the actions sought.

Mr. Richmond earned his Bachelor's degree in Economics from Moravian College, Bethlehem, Pennsylvania. He then went on to earn two Master's degrees in Business Management and in Energy and Environmental Policy from the Claremont Graduate University in Claremont, California.

Maureen Scanlon, P.E., C.E.M., Engineer. Ms. Scanlon coordinates the Green Building Program's commercial division. Her concentration is on energy efficient construction and all of the related design, analysis, and code issues. She brings a wealth of experience as an energy analyst, HVAC designer, and as co-editor of "Guidelines for a Sustainable New Austin Airport" and "City of Austin Sustainable Building Guidelines Volumes I, II, and III."

Ms. Scanlon earned her Bachelor's degree in Mechanical Engineering from the University of Texas at Austin, Austin, Texas.

Lee Gros, Project Manager / Architect. Mr. Gros is a registered architect with the Green Building Program's commercial division educating architects, builders, and building owners on the designs, practices and materials used to design, build and maintain energy and resource efficient buildings. He has a concentration on daylighting, the design/build process, and facilitation. Prior to his work at Austin Energy, he demonstrated his ability to develop and promote sustainable building activities to builders and consumers through his experience with the State Energy Office in establishing the sustainable schools program with the State of Texas.

Mr. Gros earned his Bachelor's degree in Architecture from the University of Houston, Houston, Texas.

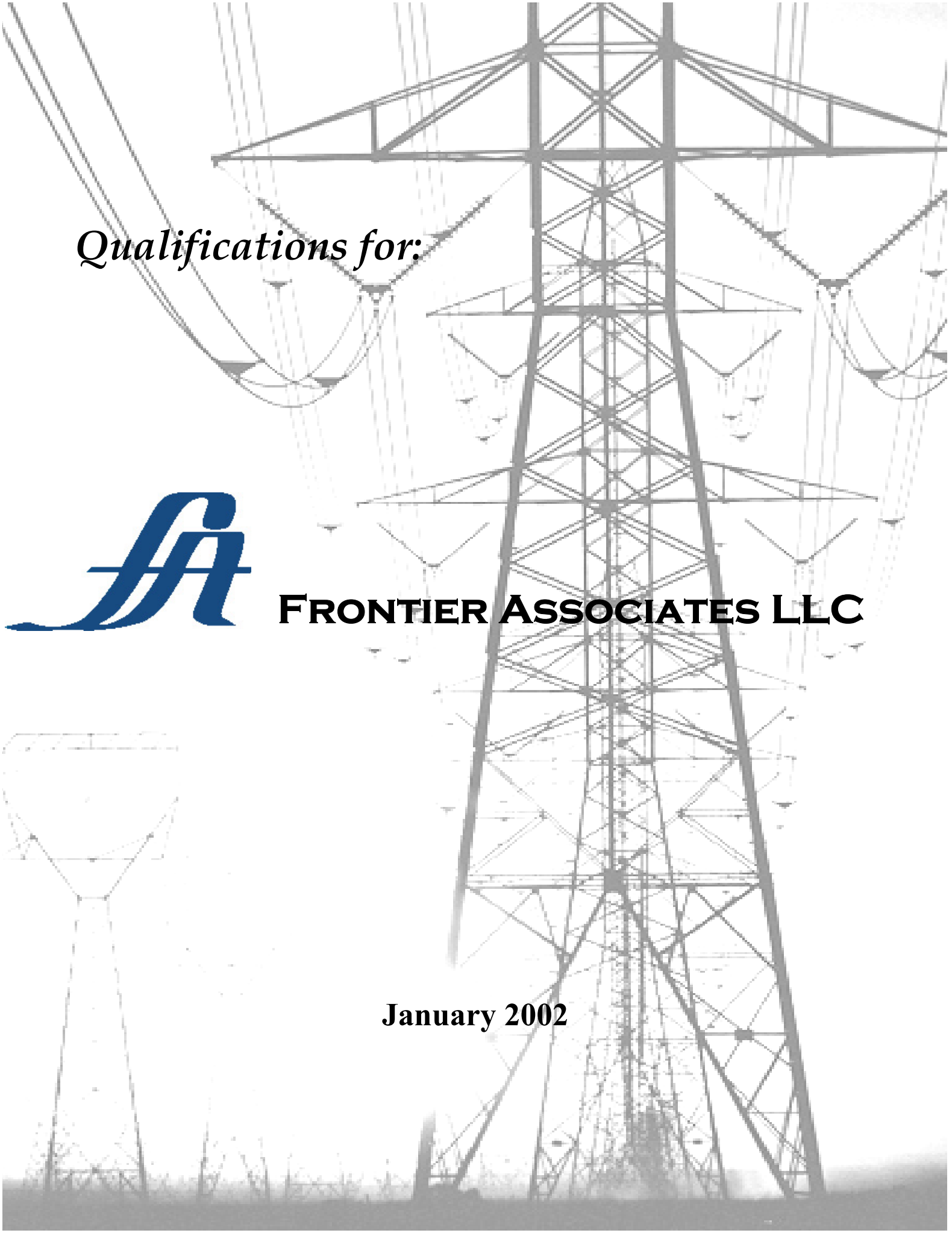
Jill Mayfield, Marketing Specialist. Ms. Mayfield coordinates the Green Building Program's marketing and public outreach efforts. Her concentration is on simple, effective marketing and public education which gets the audience's attention, informs them of the issues, and then prompts them to take action. She has many years of experience promoting environmental and green building issues and programs and in developing educational materials and publications through all types of media. She offers

a perspective on laying out information in a fashion which is readable, attractive and useable by the audience.

Ms. Mayfield received her Bachelor's degree in Journalism from the University of Texas at Austin, Austin, Texas.

Appendix A: Letters of Support

Appendix B: Frontier Corporate Qualifications



Qualifications for:

Frontier Associates LLC

January 2002

FRONTIER ASSOCIATES LLC

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1 COMPANY PROFILE

Frontier is a fast-growing energy consulting firm, having emerged as a leader in the development of Texas' restructured electricity market. Frontier's experience is not limited to Texas – the Company has experience providing services to clients from Oregon and California to Washington, D.C.

A LEADER IN EFFICIENCY SERVICES

Established in 1999, Frontier quickly became the leading energy efficiency consultant to investor-owned utilities in Texas. On a national level, Frontier is emerging as an important consultant to electricity retailers, electricity distribution companies, power generators, natural gas distributors, electricity and gas consumers, and manufacturers of energy efficiency related products.

Frontier's growth and success is founded on our unparalleled knowledge of market and regulatory issues facing utility companies, business and industry, regulatory bodies, all levels of government, and consumers, as evidenced by our diverse client base and professional staff.

Frontier Associates delivers its consulting expertise to clients in each sector of the energy industry:

- Utilities: Frontier Associates works with electric and gas utilities on a variety of topical areas including sales and marketing, program design and evaluation and pricing. Our capabilities are well suited to either the regulated or competitive side of today's utility business.
- Commercial and Industrial Customers: Frontier Associates provides a broad range of energy use and procurement services to its C&I clients, ranging from load profiling to pricing options to developing bids into utility or state sponsored efficiency projects.
- Allied Industries: Manufacturers, distributors and retailers are affected by a number of utility and regulatory initiatives to promote higher efficiency products. Frontier Associates provides consulting services to allied industry clients on how to prosper through participation in these programs.

2 UTILITIES

UTILITY CONSULTING

Frontier Associates' largest client base is among electric and gas utilities. The company provides a variety of services, including:

- Program Design
- Program Implementation
- Program Evaluation
- Regulatory Support (rate design and rate filings)
- Load Forecasting

Key projects include:

XCEL Energy – Assist the XCEL retail electricity company with new product development.

SoCalGas – Conduct market research and design programs for the commercial market, particularly underserved markets such as the independent lodging and laundry markets.

American Electric Power – Develop Internet interface and database management tools for on-line administration of residential and commercial standard offer programs.

Reliant Energy – Provide independent evaluation of power supply bids for Reliant's transmission and distribution facilities.

Reliant Energy – Provide weatherization program implementation services.

TXU Electric and Gas – examine interruptible load and load curtailment resource options in a restructured electricity market.

Frontier has also assisted power producers with project development, including support for renewable energy and cogeneration projects. Company personnel assisted each of the Texas investor-owned utilities with design and implementation of their standard offer programs, provided forecasting and fuel-cost recovery models for a municipal utility and provided regulatory support to a generation and transmission cooperative in a power-contract regulatory proceeding.

3 COMMERCIAL AND INDUSTRIAL

AN ENERGY PARTNER FOR INDUSTRY

Frontier's expertise in energy production, fuel supply, and energy management provides commercial and industrial energy users a valuable resource, particularly in today's energy market. Frontier is providing the following services to commercial and industrial clients:

- Load profiling
- Load aggregation analysis and support
- Rate option evaluation
- Power and fuel procurement

Key projects include:

Clarion Realty Services – Assist client with power purchase for several large office buildings

Nucor Steel – Assist client with rate negotiation and favorable regulatory treatment in critical rate cases

Texas Industries - Assist client with rate negotiation and favorable regulatory treatment in critical rate cases

Houston BOMA – Assist the Houston Building Owners and Managers Association with review of power procurement options in the restructured Texas market

Solutia (formerly Monsanto) – Assist with electricity procurement

Vetrotex American (Saint Gobain) – Analysis of various energy options

Frontier Associates is also a one-third owner of Retail Energy Aggregators of Texas, a licenced aggregator serving several statewide associatons seeking to aggregate loads under Texas' newly competitive power supply market. Our clients include the Texas Automobile Dealers Association, the Texas Petroleum Marketers and Convienience Store Association, Texas Restaurant Association and the Texas Apartment Association.

4 ALLIES

INDUSTRY ALLIES

Allied industries play an important role in the U.S. energy industry. Frontier provides services to manufacturers of energy efficiency products and services to help the industry participate in utility or state sponsored efficiency initiatives. Frontier's staff can help the efficiency product supply industry take advantage of programs that promote their products:

- Market transformation programs to help move the market towards advanced technologies
- Utility rebate programs to partially fund energy efficiency upgrades
- Distributed generation or personal renewable energy promotions to reduce reliance on central generating sources

Frontier has worked with the following energy product and service industry clients:

Andersen Windows – Explore means of promoting energy-efficient window products in Texas

Cardinal Glass – Explore means of promoting energy-efficient glass in Texas

Planergy Services – assist with development of load curtailment program options arising from Texas' restructured electricity market.

SoCalGas (and others) – Develop market potential analysis and marketing plan components for newly developed products

AN EXPERIENCED PROFESSIONAL STAFF

The Frontier team is a diverse group of professionals with extensive experience in the energy industry with a specific focus in the following areas:

- Market research and planning
- Regulatory issues/compliance
- Energy efficiency/conservation
- Training
- Utility rate design/negotiation
- Load/demand management
- Electricity market restructuring

Appendix C: Austin Energy Green Building Team Qualifications

The Green Building Team's Approach and Experience

History of the Green Building Program

The traditional method for enacting change in building practices has been through the adoption of codes and ordinances that force compliance with a given standard. This can be successful if the municipality can enforce the regulations, but it frequently creates political clashes of varying degrees between the governing body and the regulated party. These clashes often delay and compromise the enactment and intent of environmental initiatives. An alternative approach is to design a program that "sells" itself to the general public and building practitioners without mandatory or financial incentives. The Austin Green Building Program is designed around this marketing, educational and market transformation approach.

The City of Austin implemented a home energy rating program called Austin Energy Star Program in 1982. It was designed to give marketing assistance to builders who produced energy efficient homes that exceeded the minimum requirements of the newly adopted City Energy Code. More than 6,000 homes have been rated under this program, and most of the active builders in the Austin area participated. Visible improvements in the energy efficiency of the new home building stock were seen over the years associated with this program. To take this success a further step, it was proposed that this approach be used to promote a broader scope of residential building environmental issues by taking the entire building's effects into consideration rather than just energy efficiency.

The Green Building Program was initiated through a grant awarded in 1990 from the Urban Consortium Energy Task Force to develop a "Sustainable Systems Rating Program." Early development assistance was received from the Center for Maximum Potential Building Systems of Austin, Texas. Two subsequent grant awards were received in 1991 and 1992 to further develop and enhance the Program. Technical and logistical information related to green building was compiled and developed into a Sustainable Building Sourcebook for the second grant. A green demonstration project, the Green Habitat Learning Project was conducted for the third grant. Since 1993, the City of Austin's municipal electric utility, Austin Energy, has primarily been funding the entire operation of the Program, and staff assigned to the Program and has increased the staff from one to twelve professionals.

Outside recognition and approval for the Program has been instrumental in gaining favorable local attention. The Program received an international award from the United Nations at the Rio de Janeiro "Earth Summit" in 1992 (one of twelve awarded worldwide to local government environmental initiatives, and the only US winner) and several national awards from organizations such as the Demand Side Management Association, Public Technology Incorporated, and Renew America. Along with state and local awards, the Austin City Council has passed resolutions giving special recognition to the Program. This level of endorsement has strengthened the Program's influence on policy and City activities.

Program Purpose

The purpose of the project at its inception in 1990 was to develop a Sustainable Systems Rating Program that can be used as a marketing tool to encourage high levels of resource conservation, appropriate resource usage, and positive economic development in new residential homebuilding. Rating systems such as Austin's Energy Star Rating Program for new

homes had become recognized as effective methods to bring about energy conservation. In the Green Building Program, a rating system is used to lead homebuyers to look at and demand new homes that conserve all natural resources, minimize pollution, and impact positively on the local economy. The rating system, as part of a comprehensive marketing program, was presented as offering an effective strategy to shift homebuyer and homebuilder consciousness such that housing is generally improved and the local economy is strengthened without compromising the quality of the local and global environment. The Green Building Program was created within the City of Austin Environmental and Conservation Services Department to fulfill this purpose.

Program Development

Energy, Water, Solid Waste, and Building Material issues formed the core of the Program's past appraisal of a home's resource impact. This purposely limited the evaluation at the outset to the building itself. It was decided that consideration of additional issues such as scale, location (infrastructure and transportation issues), zoning, and others, although of major importance, would delay and complicate the development of a single model that could be used as an initial step to rate a building proper. The four resource areas were presented and discussed in the initial Green Building Program document, the City of Austin Green Building Guide. This Guide included background information on the four resource issues and a self-rating section, which allowed users to assess the relative "sustainability" of a subject home.

Intended for the general public and the building community, the Green Building Guide was the central marketing product of the first phase of the project. The Guide listed building options that were selected as being generally understood to be positive additions to a building in the Austin region. A decentralized bioregional perspective was accepted as an essential tenet of a sustainability-based approach. Any transferable considerations of individual building options listed in Green Building materials must take this into account. The list of building options included many that were common but also introduced less familiar ones as well. This mixture of usual and unusual building options avoids stereotyping the program's intent as being either "greenwashing" or "far-out." This reinforces the fact that a fresh look at all building approaches is needed.

Sustainability Rating

Criteria were developed to quantify the relative "sustainability value" of listed options, and encompassed the following general guidelines or themes:

- Optimize the use of site resources in a non-deleterious manner.
- Conserve all resources.
- Encourage recycling and the use of recycled materials.
- Stimulate the regional economy.
- Minimize embodied energy and negative environmental impacts.
- Simulate natural processes.
- Minimize health threats to building occupants, producers, and the environment.

Rating values for each of the listed options were determined through an evaluation based upon a modified life cycle assessment and presented in the listings in the Green Building Guide. The final point rating, which compiled the "sustainability score" of the listed options, is reduced to a category of One Star (translate "good"), Two Stars (translate "very good"), Three Stars (translate "excellent"), Four Stars (translate "superior"). This element was provided to be the "bottom line" for those not interested in the complex details of sustainability, and to simplify the rating for marketing. (It was, however, similarly intended that as much educational benefit as possible could be derived from the process of rating a home.)

A rating of One Star was determined by measures, which go beyond standard practice, yet are readily available and not cost prohibitive. Ratings in the Two Star to Four Star categories are achieved by including options that, while not always more costly or difficult, require more commitment from the builder and homeowner.

The Sustainable Building Sourcebook

After listing "green" building options in the Green Building Guide in 1991, we recognized that the next step would be practical guidance and information in how to implement the options. This is done through regular technical seminars and conferences sponsored by the Program and through a manual designed for building professionals - the Sustainable Building Sourcebook. (Concurrently, ongoing educational efforts through media articles and speaking engagements are used to reinforce the program's viability to impact building practices to the general public.) Each topic area contains an overview and a matrix of the commercial status and implementation issues of the topic. The Guidelines category presents implementation information. In the Resources category, there are three subsections listing information - Professional Assistance, Materials/Components/Systems, and General Assistance. There are 43 topics divided among the Water, Energy, Building Materials, and Solid Waste sections of the Sourcebook. The 400-plus pages of information in the Sourcebook fits into a three-ring binder for updating.

Demonstration Projects

In 1993, The Program worked with an alternative learning center, the American Institute for Learning (AIL), and Austin Habitat for Humanity to construct a low income green home. The AIL program, Casa Verde Builders, did an exemplary job of using at-risk youth in an educational and training format to construct the house. The house was promoted during construction as a green demonstration and considerable media and public support and interest resulted. The success of this project has resulted in the AIL, the Green Building Program and other City programs teaming up to propose additional work of this type in association with US HUD's YouthBuild Program. The original demonstration house is owned by a Habitat for Humanity family. Starting with 8 youth working on the original demonstration house, the Casa Verde Program grew with support of an AmeriCorps grant to 20 youth and completed a green retrofit on a City owned house. The Casa Verde Builders now has 75 youth involved yearly in the construction of green low-income houses for a profit. The youth receive vocational skills, social and educational support through the Casa Verde Program as well as the opportunity to impact positively upon the community and learn about environmental issues.

City of Austin Sustainable Building Guidelines

In 1994, a City Council resolution directed the creation of Sustainable Building Guidelines with special attention to the building of the new Austin-Bergstrom International Airport. A committee of several City Departments as well as local AIA, CSI, and AGC representatives met to determine what all parties could agree to for this document. The Guidelines provide a framework for designing and building municipal structures in Austin that are potentially more functional and pleasurable than conventionally-built buildings, with minimal negative impact on the environment and savings for the City of Austin. The objectives of these guidelines are to inform clients and other professionals that the City of Austin wants to encourage:

- That sustainable design does not detract from the quality of life, nor impede progress.
- Building professionals that environmental measures are a means to provide clients with high standards for aesthetics as well as quality design.
- The design and construction of buildings that surpass current energy and land development codes.
- New standards for design excellence that will relate to energy and water conservation and environmental impact.

- Building healthy structures that have good indoor air quality, and provide source control as well as adequate ventilation using natural systems.
- Designers to specify materials that do not contribute to over-consumption of non-renewable resources.
- The integration of environmental concerns from the outset of a project.
- The preservation of the environment for future generations, so that they can enjoy the same natural beauties and wonders that we do.

These Guidelines are intended for municipal facilities. The Public Works Department's Architectural Management Division principally implements these architectural/engineering guidelines, with technical assistance from the Green Building Program commercial staff. These guidelines affect all city buildings, including libraries, fire and EMS stations, office buildings, the convention center, waste transfer facilities, as well as the new municipally owned international airport. Use of these guidelines by private sector projects is encouraged, but is by no means mandatory. The Sustainable Building Guidelines are divided up into three volumes. Volume I, Principles of Sustainable Building Design, is an overview and introduction of the topic which gives goals and strategies to achieve goals. This volume is useful for department heads and other City officials, interested citizens, building professionals, and city staff interested in sustainability. Volume II, Specifying for Sustainability, is a guide in CSI format to be used by design professionals to incorporate sustainability directly into design specifications. Volume III, Guidelines for Green Building Housekeeping and Maintenance, is intended primarily for the City staff that will be operating and maintaining City facilities.

Commercial Green Building Program

To address private commercial development, Green Building Program staff developed a new marketing-based initiative in 1996. The Commercial Green Building Program uses existing financial incentives from the electric utility geared for demand side management and incorporates them into the design process. Thus, rather than awarding a rebate based on simply installing an improved HVAC system near the end of a project, the design stage of the project must include certain steps that will assure improved sustainability performance for receipt of a rebate from this initiative. The primary difficulty currently with this program is getting the attention of new project owners at the early stage necessary to accomplish a green commercial project. An awards/recognition program called the BEST (Businesses for an Environmentally Sustainable Tomorrow) Program reinforces the Commercial Green Building Program efforts by increased visibility. Based on a successful program in Portland, Oregon, the BEST program showcases businesses that are making sustainability-related improvements in a full palette of activities, not just in new construction or remodeling.

Conclusion

The Austin Green Building Program was developed based upon the success of marketing energy efficiency through the Energy Star Rating Program for new homes. The fundamental strategy is to inform buyers of the more "earth-friendly" options available to them when building a new home or commercial building, while educating building professionals and using the building industry as the mechanism for distributing information on sustainable building. This positive, market-oriented approach brings interested buyers and informed building professionals together, stimulating voluntary improvements and maintaining a working relationship between the building industry and municipal government, while increasing the overall understanding of the public on the issues of sustainable community development.

This history has formed the basis of our past field experience. In the next section, we will explain what our present working activities are and what they are teaching us about transforming a marketplace.

Present Austin Green Building Program Activities

The mission of The Green Building Program is to accelerate the integration of sustainable building products and practices with mainstream building through marketing, education and technology transfer. This has been our mission from the start in 1990 and continues on throughout our history. We encourage construction professionals and consumers to incorporate sustainable building practices, systems, and materials for new and retrofit construction into residential, multi-family, commercial and municipal/institutional buildings. Our success is due to the fact that we are promoting ideas, which are "win-win" propositions; improved building quality, reductions in utility bills, reduced maintenance costs, improved indoor air quality, and resource conservation.

The Green Building Program staff is recognized nationally for expertise in "green" residential and commercial construction. Our staff provides a full range of Green Building consulting services to help construction professionals design and build better buildings—ones that are durable, energy efficient and more pleasant to work in. We also produce a number of publications to assist construction professionals and consumers in making good choices when choosing green building materials and systems.

Program Incentives and Marketing

The primary incentive for our professional members is marketing assistance and education. In a competitive market, businesses need ways to be distinguished from their competitors. At this time in the building industry, green building represents one of the very few new ideas on the horizon. In general, we like to work with the leaders in the each market sector. They are interested in looking ahead to the future and to maintaining their leadership. When the leaders in the field have taken on green building as a way of doing business, then the followers will simply copy them in time. We do not generally spend much of our time with the followers, since they will not make a change until competition forces them to do so.

Professional Education and Membership

The Program offers a membership program for local building professionals who have made a commitment to build "green." At the present time, our membership includes 60 architectural firms, 4 design/build firms, 53 builders/remodelers, and 65 product/service providers. Our product and service providers include consultants, developers, building product suppliers, a/c contractors, electricians, engineers, mortgage companies, landscapers, pest management companies, real estate, rainwater collection, solar power companies, and septic experts. We strongly believe in not just having builders in our program, since all of the product and service providers are as key to bringing green building to a successful level. Professionals and laypeople all influence others, and personal referrals, as we all know, are usually much stronger than any other kind of marketing.

All members enrolled in the Program are required to attend a half-day "green building basics" training which cover the fundamentals of sustainability and how it relates to the specific environment of the building. They must also attend a minimum of two technical seminars per year (although most of our members attend many more). The primary obligation of the members is to serve as a resource for interested buyers, promoting and distributing program information, and avoiding misrepresentation of the program. The builders and architects agree to rate their homes and make the ratings available to prospective buyers.

Members also receive a number of benefits by participating:

- use of Green Building Program logo in their marketing materials
- a free copy of the Sustainable Building Sourcebook

- technical and marketing assistance from program staff for their firm and their customers
- a listing and company description in our membership directory
- networking opportunities with other green building professionals
- subscription to our bi-monthly Green Building News
- an opportunity to stretch their marketing dollars through partnership with the Green Building Program's advertising and marketing
- the opportunity take literature, rent books and videos from our resource library
- monthly technical seminars (continuing educational credits given)

Examples of recent technical seminars are active solar technology, indoor air quality issues, on-site wastewater, windows, inexpensive green building ideas, stormwater control, reflective roofing, and construction geology. We also have an annual 3-day international Green Building Conference. Our past seventh conference drew 1500 attendees with over 180 exhibitors.

Partnerships

Receiving an international award for the Program at the 1992 United Nations Conference on the Environment and Development plus numerous national and local awards have helped lend credibility and promotion to our efforts and have resulted in a high national and international profile. Nevertheless, a boom economy currently occurring in Austin has created a frenetic pace of construction activities that has been difficult for the Program to significantly address by itself. With a population of over 1 million people, partnerships are key to spreading the message and education.

In the last year, we have developed a focused partnership with the local builders association to increase participation among their members. The City Council has also created a Green Building Task Force made up of professional and consumer representatives, whose goal is to increase participation in the Program and education of the public and professionals. Two organizations that have spun off from the Program, the Sustainable Building Coalition and the Straw Bale Association of Texas, now each have a newsletter and monthly meetings with regular attendance of 50-70 people. We also work closely with the Texas Solar Energy Society on a combined green home and commercial building tour. And after years of effort, the main local newspaper is featuring at least one to three articles weekly in the home section on building issues related to green building

Public Education

We conduct public education through advertising, lectures, trade shows, home tours, publications, fact sheets, newspaper and magazine articles, web sites, etc. Despite the success of the Green Building Program and our educational efforts, construction activities and public awareness still need attention. We cannot stress any one issue more to newcomers in the green building field than this: public and professional education is time consuming, expensive, and requires constant attention over many years, before a significant change starts to occur. Consumers are bombarded with advertising and overloaded with information that they find incredibly difficult to process. Effective marketing and education campaigns take a special skill of discovering where and what people will be willing to read and then what they will be willing to act on.

In the last two years, one of the ways we have noticed an ever-increasing knowledge of green building among the Austin public is by the increased level of sophisticated questions from call-in customers, lecture attendees, and our visitors at local trade shows. We also receive strong positive feedback from our professional members who are telling us that they need to do less client education, because they are now getting customers who are already sold on green building due to our education and marketing efforts. Clients are now initiating the requests for a

green building to be designed and built for them. The professionals now need to do less education to convince clients of the value. Free media attention has also resulted from our efforts in assisting in some outstanding examples of residential, multi-family, and commercial green projects. Green building is now being discussed in our City on a regular basis and when the results such as these start to show, you can be assured that they will have some staying power, because you have experienced a market transformation.

Residential
The Residential Green Building Program rates new homes and remodels using "green" guidelines on a scale of one to five stars: the more stars the more green features in the home. Homes are rated in five areas: energy efficiency, water efficiency, materials efficiency, health and safety, and community. A home built in the Austin Energy service area may be rated if the builder or architect is a member of the Green Building Program. We like to promote the idea that homes rated by the Green Building Program can look like any other home and that they come in all colors, designs, shapes and sizes. We encourage buyers to look for the Green Building Program Logo on one of our yard signs in front of the home, on a sticker in one of the front windows of the home under consideration, on a posted rating certificate, or on the builder's marketing materials.

We encourage people to buy a home rated by the Green Building Program because:

- they can (This is the first and oldest green building rating program in the country, and one of only a few cities in the country where you can buy a rated green home)
- they can save money on utility bills
- they can save money on maintenance costs
- they can achieve better indoor air quality
- they can buy a higher quality home
- they can contribute to environmental improvements for future generations

We provide various forms of information to the homeowner or the building team to make good material and design choices. We offer fact sheets, publications, a web site, a green building resource room, public presentations, and personal consultations.

Commercial
Our commercial staff consult with designers, engineers and construction professionals during the design phase of building to provide information on resource efficient building materials and systems, reducing construction and operations waste, improving indoor air quality, and on environmental and financial issues during the design and construction process. We also provide a small cash incentive to the design team for "green" new construction and major renovations.

The commercial program also organizes the BEST Awards (Businesses for an Environmentally Sustainable Tomorrow), a concept, which we modeled after Portland, Oregon's BEST program. It recognizes Austin companies that have made outstanding achievements in sustainable building and operation of their business. Awards are given in the areas of water conservation, water quality, energy conservation, waste management and land use. There is also an award for overall achievement.

Multifamily
Green Building Multifamily Program helps developers, owners and builders build and remodel resource efficient, durable and cost effective housing. This group brings together the expertise of many different city departments to help construction professionals create housing that will be easy to maintain, affordable for residents and good for the community. Our services include: (1)

consultation services for developers, designers and builders for new construction and renovation, (2) incentives for energy, water and gas efficient appliances and systems, and (3) marketing assistance.

The Green Building Program has in the past dealt with multi-family projects on an individual case-by-case basis, but enough interest has now been developed to justify the development of a dedicated multi-family green building program, which has specific guidelines and a rating system. It will be a hybrid of our residential and commercial programs, and we expect to have this program in place by the Spring of 2000.

Municipal

The City of Austin implements green building concepts into its own facilities through the implementation of the Sustainable Building Guidelines. These guidelines were written by the Green Building Program's commercial staff. The Department of Public Works, Architectural Management division, is the main implementor of the Guidelines. The Green Building Program acts as a technical advisor and facilitator for project managers and clients. The Public Works Department requires that all architectural firms working on City projects prove that they have strong, in-house knowledge of green building or they must hire one of the approved green building consultants on the City's rotation list to advise them on using the Sustainable Building Guidelines. The in-house architectural firm's designee or consultant reports directly to the City project manager rather than just working within the architectural firm. The City has also hired a green building consultant team to work with all contracted projects and act as a facilitator to set the goals for the project, give technical consultation, and act as a monitor to ensure the implementation of the guidelines.

The City's Neighborhood Housing and Community Development Department also participates in green building efforts by requiring the construction of minimum one-star buildings for affordable housing projects which receive City of Austin financial incentives.

Consulting Services

We offer specialized green building consulting services for customers throughout the country. We have done all of this work in our service territory for many years and have become well known throughout the country and world for our achievements. Our typical customers are utilities, government agencies, builders/developers, and architectural/engineering firms. Our typical services include: (1) design and specifications review, (2) energy analysis/modeling, (3) green specifications, (4) construction and operations guidelines, (5) instructional manuals, (6) marketing consulting, (7) program development, (8) training seminars, (9) program evaluation.

Economic Development

The increased number of green homes and commercial buildings are starting to approach a critical mass that impact upon the general culture of building and living in Austin. The economic feasibility of green building also depends on our efforts to help steer economic development activities into regional business startups such as waste to material processing. We have already seen successful business startups in the green building service sector with rainwater harvesting, integrated pest management, concrete finish floors, and alternative wastewater services. Material suppliers are adjusting their offerings, as they perceive shifts in demand toward green building. We have seen strong increases in sales of such materials as recycled wood, composite decking lumber, advanced insulations, structural insulated panels, recycled-content block wall systems, no-VOC paints and finishes, radiant barriers, continuous ventilation systems, and metal roofs. Our program has also attracted many architects, builders and product suppliers to move from other parts of the country to Austin, because of the mature green building market that exists here. These are benefits that a City like Austin or a region like Southern California can value far beyond the specific building of green buildings.

Market Transformation

The professional building industry is especially difficult to change, as it is a very traditional, slow-moving industry. Statistics vary, but in general, it takes seven to fourteen years for a new product or practice to become established or mainstream in our industry. This often makes innovation incredibly difficult. Building is also very regional and parochial, and as such, what works or is accepted in one area of the country may or may not work in another area. Our industry also only spends 0.1% of its revenues on research and development. This is very little as compared to other industries such as high tech, which spends 30%, and even to a mature industry such as the steel industry which spends over 1%.

After nine years of dedicated work, the Green Building Program has become an integral part of the local building industry, homes and commercial buildings embracing green features are highlighted in advertising and award programs. The local homebuilders association, remodelers association, the local chapter of the AIA, and the realty associations have supported the Green Building Program because the approach allows building professionals to participate in a positive, education-oriented program and make voluntary improvements in response to buyer demand instead of through mandatory regulations. They have been helpful allies in getting their members to enroll in the Program.

How you present yourself also has a big impact on your success in gaining new members. In 1998, we officially changed our named from The Green Builder Program to The Green Building Program to change the impression that we were a program for builders only. Consumers, architects, commercial contractors, product suppliers, realty professionals, and other building professionals thought such a program did not apply to them. Our program serves all of those groups extensively and the result of a market transformation desired from our program requires the strong involvement of all of those people. Since our name change 18 months ago, we have noticed more attraction to our program by “non-builders.” We have also seen increase in our program, because it has stood the test of time and professionals who have seen us for years, but not participated, are now joining, because it has a market presence. If they don’t join now, they give their customers the impression that they are not up to the standard level of the industry.

Lessons Learned

What we have presented so far is a detailed explanation of our full program experience and knowledge. The result of that experience has been some very important lessons of what is required to achieve success in programs seeking a market transformation:

- A true market transformation can only come about with a well-funded, consistent, long-term educational effort. Short and inconsistent efforts with not produce sustainable results.
- Programs must be developed that work for your particular market. They must be developed and tested with your customers in committee and in the field.
- There is an absolute need for highly committed people who can carry a program through the to a successful implementation in the field.
- Active participation by program professional members and community partners are absolutely necessary to achieve the goals.

It is important to understand what the goals of any program are, and then to create an implementation path to get to those goals. All of the green building efforts nationwide have different goals and different pathways to get there. There are programs for residential, commercial, multi-family, affordable, and institutional. There are programs for new or retrofit construction, voluntary and required, single or multi-level rated, etc. There are purely marketing programs for builders that do little in the area of builder, other building professional, or public education. There are also programs that do conduct the very difficult, expensive and time-

consuming job of public education. It is important to truly define what it is that you want, and then take the necessary steps that will achieve that goal.

Awards

- Earth Summit United Nations Local Government Honor Award, 1992. It was one of twelve winners—the only one in the United States—of the United Nations Local Government Initiatives Honours Programme at the Earth Summit in Rio de Janiero.
- Governor's Excellence Award, State of Texas "Clean Texas 2000 Program," 1996
- Texas Society of Architects – Citation of Honor 1999 (for outstanding support to the architectural community)
- Founding Member U.S. Green Building Council. The City of Austin's Green Building Program is the nation's first environmental building rating system.
- Renew America Award for Environmentally Sustainability, 1998, 1997, 1996, 1995
- Green Building Program featured in three-part Public Broadcasting System television show "Planet Neighborhood," produced by WETA in Washington, D.C. in September 1997
- Green Building Program featured in building industry publication "In Business Magazine," November 1997 issue
- Green Building Program featured in Summer 1997 issue of "Building Ideas," a special newsstand publication produced by the Better Homes and Gardens Company
- 1996 Green Building Conference, hosted by City of Austin Green Building Program, featured on "Our House," a syndicated home improvement television show currently broadcasting in several U.S. markets City of Austin Environmental Board Environmental Awareness Award, 1994, Honorable Mention, 1995
- "Top Ten U.S. Energy Conservation Programs," IRT Environment, Inc., 1995
- PTI Technology Achievement Award, Public Technology, Inc., 1994
- Innovation in Demand Side Management Award, Association of Demand Side Management Professionals 1993
- Featured as a case study in the Tomorrow's Energy Today series by the U.S. Department of Energy.
- Featured as a case study in the Nation's Cities Weekly, a publication of the National League of Cities
- Over 40 articles mentioning the City of Austin Green Building Program in local, regional and national press since 1992.
- Listed in Preventing Pollution in Our Cities and Counties, a compendium of 19 model pollution prevention programs in the U.S. 1995. The project is funded by EPA and distributed by National Association of Counties, U.S. Conference of Mayors, National Association of City and County Health Officials, Municipal Waste Management Association, National Pollution Prevention Roundtable.

Appendix D: Frontier Staff Resumes

WILLIAM LOUIS BROOKS, JR.
Chief Executive Officer

PROFESSIONAL EXPERIENCE

1999-Present Frontier Associates, Austin, Texas

Mr. Brooks has become a leading resource on alternatives to traditional generation and transmission solutions to meet future energy needs. His recommendations have resulted in annual savings of millions of kilowatt-hours of electricity for utility customers throughout the United States. He is responsible for marketing and demand-side management (DSM) consulting services to electric and gas utilities including renewable energy and energy efficiency product development, screening and selection, marketing/business plan development, regulatory impact analysis, corporate strategic fit analysis, marketing program evaluations, and monitoring and evaluation services.

1990-1999 Planergy, Austin, Texas

As Vice President, Mr. Brooks was responsible for Planergy's consulting division, which included services to utility and commercial/industrial customers. Mr. Brooks provided a variety of regulatory support services to utility clients. These services included preparation of analyses and testimony support for renewable energy solicitations, fuel substitution cases, generation and transmission facility notice-of-intent (NOI) filings, rate case filings and energy efficiency or integrated resource planning filings.

1979-1990 Gulf States Utilities Company, Beaumont, Texas

As Administrator - Commercial Marketing, Mr. Brooks' responsibilities included defining commercial program objectives, assessing market potential, selecting appropriate technologies and implementing promotional activities to achieve objectives. Mr. Brooks directed market research and end-use metering projects supporting commercial programs and provided regulatory support for commercial program related filings.

As Supervisor of Community and Institutional Programs, Mr. Brooks established and administered GSU's residential energy efficiency, consumer information and school programs, produced literature and displays, developed community energy management programs, developed educational and technical software for schools and in-house use and provided employee energy management training programs.

While serving as Coordinator of Consumer Information, Mr. Brooks wrote and produced consumer information literature, designed and produced energy information displays and established GSU's low-income energy information and weatherization related programs. He produced newsletters for internal and external communications.

1978-1979 Economic Opportunity Commission of South East Texas, Beaumont, Texas

As Administrator – Community Development, obtained and administered federal, state and local grants to conduct community development programs including weatherization, demolition and job opportunities/training programs.

TESTIMONY, PRESENTATIONS AND INSTRUCTION

- Testimony in rate and franchise renewal cases before the City Councils of Port Arthur, Groves and Nederland, Texas, 1978 - 1979.
- Testimony before the Texas House State Affairs Committee on residential energy audit programs, 1981.
- Testimony before the Texas Senate Natural Resources Committee on solar energy and legislation enabling solar access and site orientation ordinances, 1982.
- Testimony before the Public Utility Commission of Texas on a promotional rate for Gulf States Utilities Company, 1989.
- Testimony filed before the Public Utility Commission of Texas in Southwestern Public Service Company's application for approval of a Notice of Intent to construct a cogeneration facility and a combustion turbine, 1995.
- Classroom guest lectures at Lamar University Education Department (1981-1986).
- Various presentations at annual conferences, including Demand-side Management Conference, 1985, Texas Chapter - Future Farmers of America, 1982, Demand-side Management Conference, 1981, Texas Chapter - National Organization of Housing and Redevelopment Officials, Annual Conference, November 1980.

OTHER

- Appointed by Governor to the Texas Weatherization Advisory Council, 1984.
- Awarded Texas' "Technology Transfer '80's Award" by Public Utility Commission of Texas, 1984.
- Appointed to Texas Department of Human Resources' Income Assistance Advisory Council (state level), 1983.
- Recognized by EEI for Transferable Outreach Program, 1984.
- Member Association of Energy Services Professionals, Association of Energy Engineers, American Society of Heating, Refrigerating and Air-Conditioning Engineers

EDUCATION

- Post graduate work at Lamar University, Beaumont, Texas
- Bachelor of Business Administration, University of Texas at Austin, 1976

JAY ZARNIKAU, Ph.D.

President

PROFESSIONAL EXPERIENCE

1999-Present President, Frontier Associates, Austin, Texas

Dr. Zarnikau has pioneered the development of new pricing strategies for electric and water utilities, and contributed significant advances in the state-of-the-art in utility planning. Dr. Zarnikau is responsible for providing assistance in the design and implementation of energy efficiency programs, utility resource planning, electricity pricing, rate analysis/design, program evaluation, demand forecasting, and energy policy. He also assists large industrial energy consumers in rate negotiations and energy procurement activities.

1992-1999 Vice President of Strategic Planning and Pricing, Planergy, Austin, Texas

Dr. Zarnikau was responsible for providing assistance in the design and implementation of energy efficiency programs, and providing consulting assistance in the areas of utility resource planning, electricity pricing, program evaluation, demand forecasting, and energy policy.

1991-1993 Manager of Energy Strategies Research Program, The University of Texas at Austin Center for Energy Studies, Austin, Texas

Held faculty-level research position. Served on dissertation and thesis committees. Supervised independent study projects.

Responsible for the oversight of research projects in the areas of utility resource planning, regulation, electricity pricing, and policy analysis.

Coordinated a study of the technical and achievable potential for energy efficiency savings in Texas.

Program Manager for EPRI-sponsored effort to develop a new integrated resource planning framework and model.

1988-1991 Director of Electric Utility Regulation (Acting Director from May 1988 to October 1988), Public Utility Commission of Texas, Austin, Texas

Supervised a professional staff of over fifty accountants, economists, and engineers responsible for analyzing regulatory and technical issues and providing the Commission with recommendations.

1985-1988 Manager of Economic Analysis, Public Utility Commission of Texas, Austin, Texas

Supervised a staff of twelve economists and engineers responsible for analyzing economic, statistical, policy, resource planning, and modeling issues arising in proceedings before the Commission.

1983-1991 Economic Analyst, Public Utility Commission of Texas, Austin, Texas

Prepared and defended testimony in over twenty proceedings on topics including: load forecasting, rate design, cogeneration, system planning, demand-side management program impacts, billing determinants, wheeling, and computer modeling.

Responsible for:

- Load and Capacity Resource Forecast Project. (1984 through 1988)
- End-Use Modeling Project. (1986 through 1990)
- Optimal Systems Project. (1988 through 1990)

EDUCATION

Ph.D. (1990) and M.A. (1983) in Economics, University of Texas at Austin

B.S. in Business Administration and Economics, State University of New York, Oswego, New York, May 1981

McGill University, Montreal, Quebec, 1979-1980

PUBLICATIONS AND RESEARCH PAPERS

Refereed Journals:

"When Different Types of Energy Resources are Aggregated for Use in Econometric Studies, Does the Aggregation Approach Matter?," accepted for publication in Energy Economics.

"Will Tomorrow's Energy Efficiency Indices Prove Useful in Economic Studies?," forthcoming in The Energy Journal.

"A Re-examination of the Causal Relationship between Energy Consumption and GDP," Journal of Energy and Development, 1996.

"The Role of Demand-Side Management Programs in the Emerging Markets for Ancillary Services," under review by Energy Services Journal, 1996; with Martin Baughman and Shams Siddiqi.

"Energy Efficiency Opportunities in the Industrial Sector," Energy Engineering, Vol. 93, No. 3, 1996; with Alex Lee.

"Can Different Energy Resources be Added or Compared?," Energy - The International Journal, 1995, Vol. 21, No. 6; with Philip Schmidt and Sid Guermouche.

"The Evolution of the Cogeneration Market in Texas," Energy Policy, Spring 1996;

with Robert Reilley.

"Advanced Pricing in Electrical Systems," IEEE Trans. on Power Systems, 1995; with Martin Baughman and Shams Siddiqi.

"Integrating Transmission into IRP," IEEE Trans. on Power Systems, 1995; with Martin Baughman and Shams Siddiqi.

"Spot Market Pricing of Water Resources and Efficient Means of Rationing Water During Scarcity," Resources and Energy Economics, 1995.

"Customer Responsiveness to Real-Time Pricing of Electricity," The Energy Journal, December 1990, Vol. 11, No. 4.

"Spot Market Pricing of Electricity," Forum for Applied Research and Public Policy, Winter 1990, Vol. 5, No. 4; with Martin Baughman and George Mentrup.

Non-Refereed Journals, Proceedings, and Research Reports:

"Market Power and Market Concentration in Texas," The Electricity Journal, Fall 1998; with Amy Lam.

"Has Texas Become a Net Importer of Energy Resources?," Texas Business Review, June 1997.

"Opportunities for Energy Efficiency in the Texas Industrial Sector," ACEEE Summer Study on Energy Efficiency in Industry Proceedings, August 1995; contributor.

Opportunities for Energy Efficiency in the Texas Industrial Sector, for the Sustainable Energy Development Council, 1995; contributor and project leader.

Neoelectrification of Industry in the Information Age, for the Edison Electric Institute, 1994; with Philip Schmidt, Frederick T. Sparrow, and John Vanston.

Advanced Pricing in Electrical Systems, CES Discussion Paper, October, 1992; with Martin Baughman and Shams Siddiqi.

Opportunities for Energy Efficiency in Texas, Center for Energy Studies, May 1992; with Bruce Hunn and other contributors.

BRUCE MAST

Senior Associate

PROFESSIONAL EXPERIENCE

2000-Present Senior Associate, Frontier Associates, Austin, Texas

A recent addition to the Frontier Associates Team, Mr. Mast brings ten years of experience in the utility industry as a project manager, market researcher, and quantitative analyst. Under Texas' emerging competitive electricity market, Mr. Mast is actively assisting commercial ratepayers who wish to aggregate load for bulk procurement of electricity. He has also taken primary responsibility for research activities associated with developing a marketing plan for gas-fired cooling technologies.

1999-2000 Vice President, Pacific Consulting Services, Albany, California

As Vice President of PCS, Mr. Mast was responsible for generating roughly $500,000 in annual gross revenues. In this capacity, he supervised market research activities of three associates and coordinated activities of multiple subcontractors. Mr. Mast directed all data collection and analysis activities associated with phone and mail surveys, focus groups, and mystery shopper visits.

Mr. Mast managed a statewide project to assess strategies for improving the overall efficacy of the energy codes and their support mechanisms, and reducing the gap between paper compliance and actual building performance. Particular attention was paid to building commissioning, diagnostic testing, home energy rating systems, energy-efficient financing, and processes that both improve energy efficiency and reduce insurance liability and losses.

Mr. Mast directed all phases of market research to support City of Palo Alto Utilities' preparations for operating in a deregulated environment.

1995-1999 Project Manager, Pacific Consulting Services, Albany, California

Project manager overseeing PG&E baseline study of residential and nonresidential evaporative cooling technologies. The study made use of focus groups, delphi interviews, and telephone surveying techniques to capture a broad range of market information relating to evaporative cooling in California's Central Valley.

Manager of a multi-year evaluation of a residential lighting fixture market transformation program.

Key member of team to review 15 market effects studies for the California DSM Measurement Advisory Committee (CADMAC). Served as primary

author of project review of CADMAC's Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs.

Developed evaluation plan, formulated phone survey questionnaire, directed data management and conducted net impact evaluation of Southern California Gas' nonresidential new construction program.

Directed and conducted four studies to verify claimed impacts of Southern California Edison's Commercial, Industrial, and Agricultural Performance Adder program. Tasks included sample design, review of program documentation, replication of engineering calculations, and statistical estimation of verifiable impacts and confidence intervals.

Directed data management and conducting gross and net impact evaluations of a residential refrigerator recycling program for Planergy and San Diego Gas & Electric.

1991-1995 Senior Analyst, Pacific Consulting Services, Albany, California

Directed data management and conducted gross and net impact evaluations of Pacific Gas & Electric's nonresidential new construction program.

Constructed databases and performed statistical analysis of billing and mail survey data to develop gross and net impact estimates for Southern California Edison's two largest nonresidential DSM programs.

Compiled a complete history of expenditures, energy savings, and load reductions associated with Southern California Edison's conservation and load management programs.

1988-1991 High School Science Teacher, Peace Corps, Republic of Benin, West Africa

As a Peace Corps volunteer, Mr. Mast conducted physics and chemistry courses in French for approximately 150 high school students. In addition, he organized an agricultural cooperative in a neighboring village and helped them obtain oxen and farm implements. Mr. Mast also trained incoming Peace Corps volunteers in appropriate pedagogical techniques.

EDUCATION

B.A. (1988) in Physics, Rice University, Houston, Texas

PUBLICATIONS AND RESEARCH PAPERS

Non-Refereed Journals, Proceedings, and Research Reports:

"Carrots or Sticks? Policy Options for Energy Codes" with Jennifer McCormick, Tom Vogt, Patrice Ignelzi, Erik Kolderup, Mark Berman, and Mary Dimit. Proceedings of the 2000 ACEEE Summer Study.

"The Light at the End of the Tunnel: Future Directions in Residential Lighting Fixture Programs" with Jennifer McCormick, Patrice Ignelzi, Shel Feldman, and Ben Bronfman. Proceedings of the 2000 ACEEE Summer Study.

"Why Can't We All Just Get Along? A Reconciliation of Economic and Innovation Diffusion Perspectives of Market Transformation," Proceedings of the 1999 International Energy Program Evaluation Conference.

ENERGY STAR Residential Lighting Fixture Program Baseline Assessment for Pacific Gas & Electric and Southern California Edison, December 1998.

Market Effects Summary Study with J. Peters, L. Megdal, and P. Ignelzi, for California Demand Side Measurement Advisory Committee, October 1998.

An Investigation into TVA's System Load Weather Normalization Procedures, with P. Ignelzi, Dr. K. Train, and Dr. R. Engle, for the Electric Power Research Institute, September, 1998.

"Getting a Good Evaluation Fit: Custom-Tailored or Off the Rack?" with P. Ignelzi and M. Goldberg, Proceedings of the 1997 International Energy Program Evaluation Conference.

"Developing Confidence in Your Net-to-Gross Ratio Estimates," with P. Ignelzi, Proceedings of the 1996 ACEEE Summer Study.

"A Comparison of Two Net Analysis Methods Using Data from PG&E's Nonresidential New Construction Program," with P. Ignelzi, E. Heitfield, and P. Rumsey, Proceedings of the 1996 ACEEE Summer Study.

1992-93 Nonresidential New Construction Programs: Gross and Net Impact Analysis Incorporating Summer End-Use Metering Data, for Pacific Gas and Electric, with SBW Consulting, Inc. and Ridge and Associates, 1996

"The New Construction Conundrum: Without a Baseline, How Can There Be a Gross?," with R. Ridge, Proceedings of the 1995 International Energy Program Evaluation Conference.

"The Role of Incentives and Information in DSM Programs," Proceedings of the 1994 ACEEE Summer Study.

"Estimation of Net Savings for Rebate Programs: A Three-Option Nested Logit Approach," with K. Train, S. Buller, K. Parikh, and E. Paquette, Proceedings of the 1994 ACEEE Summer Study.

PHILIP AUDET
Senior Associate

PROFESSIONAL EXPERIENCE

Present **Senior Associate (Contract), Frontier Associates LLC**

Mr. Audet is responsible for standard offer program design support, marketing plan development and consulting services related to field services delivered by utilities and their contractors.

1991-2000 **Vice President and Managing Director, Field Services Division**

Planergy, Inc.

Mr. Audet was responsible for the business development and operations management of Planergy's Field Services Division, which comprised 80-90% of the Company's revenues and employees. Responsibilities included the management of Planergy offices in eight states. This division was responsible for the implementation of a variety of utility programs, including all of Planergy's residential, commercial and small industrial energy-efficiency programs. These programs include audit, weatherization, lighting, equipment retrofit, water heating, and appliance programs.

Mr. Audet created Planergy's trademark Q.U.E.S.T^{sm}., Refrigerator Roundup^{sm} and LiteHouse programs.

1982-1991 **Manager, Planergy, Inc.**

Responsible for managing Planergy's Houston office, which provided implementation services for several utilities in the Texas region. These programs included low-income weatherization programs, an RCS audit program, a walk-through audit program, a water heater wrap program, and the Q.U.E.S.T. (Quick Energy Savings Test) program. Mr. Audet has also participated in public housing energy audits, commercial building energy surveys, evaluation of energy audit systems, and DSM program design and evaluation.

Mr. Audet has performed commercial and institutional building audits and surveys for numerous utilities and direct end-users. Mr. Audet was on the staff team which developed PREDICT, an equipment efficiency comparison program and assisted in the development of ComQUEST, a small commercial building audit program.

1981-1982 **Senior Auditor, Volt Energy Systems, Woburn, Massachusetts**

Responsibilities included maintaining quality control and providing technical assistance for approximately fifteen field auditors, under contract with MassSAVE.

1979-1981 **Energy Auditor, The Energy Bank, Cambridge, Massachusetts**

Performed over 600 residential, commercial and apartment building analyses.

EDUCATION

Bachelor's degree in Chemistry, Holy Cross College, Worcester, Massachusetts, 1979

AMY MCGOWAN
Associate

PROFESSIONAL EXPERIENCE

1999-Present **Associate, Frontier Associates, Austin, Texas**
Ms. McGowan is responsible for monitoring regulatory activities, developing competitive pricing strategies, and designing new services for Frontier Associates' clients. Ms. McGowan provides research and consulting assistance in the areas of utility resource planning, rate analysis and design, and DSM program evaluation.

1997-1999 **Research Associate, Planergy, Austin, Texas**
Ms. McGowan has developed utility marginal cost models, short-term fuel cost forecasts, electricity consumption forecasting model for a municipal client, rate impact analyses for industrial consumers, cost-effectiveness studies for demand-side programs and program plans for utility "public goods" programs. Ms. McGowan co-authored an article for The Electricity Journal on market concentration among electricity generators in ERCOT

1997 **Economics and Policy Analysis Intern, Public Utility Commission of Texas, Office of Policy Development, Austin, TX**
Independently authored a report for staff economists summarizing policy options related to low-income electricity programs and the restructuring of the state's electric industry. Developed a practical understanding of economic theories and further developed analytical and professional communication skills.

EDUCATION

B.A. in Economics, University of Texas at Austin, Austin, Texas.

Appendix E: Austin Energy Resumes

Jill Mayfield
Marketing Specialist

Green Building Program

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721 Barton Springs Road
Austin, Texas 78704

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Fax: (512) 505-3711
email: jill.mayfield@austinenergy.com

PROFESSIONAL EXPERIENCE

City of Austin, Austin Energy Services, Austin, Texas ***1995-present***

Marketing Specialist, Green Building Program

- Direct marketing and communications for the City's Green Builder Program, an environmental rating system for new homes.
- Promote the Green Builder Program goals to and build relationships with the private sector.
- Develop long-range public relations plan and budget.
- Handle all advertising, including budget, placement, and copy writing.
- Provide outreach services to community groups, businesses, and individuals interested in Green Building.

City of Austin Environmental and Conservation Services Department, Austin, Texas ***1991-1995***

Public Information Specialist

- Directed media relations services for 22 programs in the Department.
- Wrote press releases, public service announcements, video scripts, advertising copy, brochures, and newsletters.
- Planned press conferences, special events, and public hearings.
- Coordinated annual award-winning "Give the Lake a Break" community awareness campaign with Channel 24.
- Achieved national and international media attention for the City's Green Builder program, the Pay-As-You-Throw program, the water quality protection program, the water conservation program, and the energy conservation program.
- Initiated use of radio promotions at local hardware stores to promote energy and water conservation programs to the public.

Capital Area Food Bank, Austin, Texas ***1987-1991***

Community Relations Coordinator

- Managed community and public relations functions including media relations, special events planning, and public speaking.
- Responsible for publication of quarterly newsletter and other informational publications.
- Produced annual direct mail campaign.
- Positioned Food Bank director as an expert on hunger and poverty issues in Austin.
- Coordinated media for annual "Spirit of Sharing" food drive with Channel 7, the Austin American-Statesman, and HEB grocery stores.
- Coordinated fund-raising campaign that raised $70,000 for a drive-in freezer.

Southwestern University, San Marcos, Texas ***1986-1987***

News Bureau Manager

- Managed university's news bureau.
- Wrote news releases and feature stories about students and faculty.
- Liaison with local and regional media.
- Wrote feature story that brought national media attention to the university.
- Provided public relations support for annual Brown Symposium, a nationally-known symposium on liberal arts issues.

The University of Texas, Austin, Texas ***1983-1986***

Publications Coordinator

- Managed publications for the College of Engineering.
- Responsible for production of annual report, engineering research guide, quarterly newsletter, and all recruiting brochures.
- Supervised art staff and prepared budget.
- Wrote and edited speeches for faculty and staff.

SPECIALIZED TRAINING

- Council for Advancement and Support of Education, Communications Institute
- Public Relations Society of America, public relations planning seminar
- City of Austin Leadership Training Program
- City of Austin, Total Quality Management Training
- Seminars in PageMaker and Microsoft Word

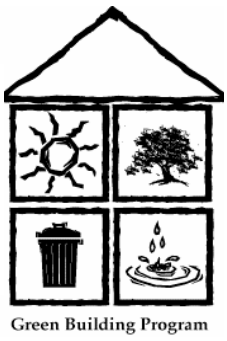
EDUCATION

Bachelor of Journalism, 1978
The University of Texas at Austin

AWARDS

- Governor's Award for Environmental Excellence
- Accredited by the Public Relations Society of America, 1996
- United States Environmental Protection Agency--1994 Award of Excellence for Water Quality Community Education
- Austin chapter of International Association of Business Communicators--1992 Award of Excellence for Non-profit Public Relations Campaign, 1992 Award of Merit for a One-time Publication, 1994 Award of Merit for Public Relations Campaign
- Austin chapter of the American Marketing Association--1992 Gold Award of Excellence for a Public Relations Campaign
- Texas Public Relations Society, 1998 Best of Texas Award for Public Service Announcements

Marc Richmond-Powers
Project Manager



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email:
marc.richmond-powers@austinenergy.com

PROFESSIONAL EXPERIENCE

City of Austin, Austin Energy Services, Austin, Texas ***1997-Present***

Project Manager, (former Program Manager) Green Building Program

- Advise and educate architects, builders, engineers, suppliers, manufacturers, and the public on energy-efficient building designs, materials, and construction practices.
- Manage an internationally recognized education and marketing program, which promotes concepts of sustainable design and construction. Manage a staff of 11 professionals and a budget of $1.3 million. (as former Program Manager)

Bowerbird Construction, Austin, Texas ***1996-1997***

Supervisor

- Supervised and constructed all stages of two sustainable residences.
- Managed 12 people, all client contact, billing, materials specification and ordering.

Zeitgeist Environmental, Pasadena, California ***1994-1996***

Principal

- Consulted to architects on environmentally-preferable building products and designs. Reviewed architectural plans and specifications.
- Participated as a sustainable design charette team leader and principal member of the post-charette publication committee.
- Wrote the winning RFP and consulted to project manage a contract with the City of Los Angeles to increase economic growth, industrial recycling, and minority employment.

Eos Institute, Laguna Beach, California ***1995-1996***

Project Co-Director

- Developed grant proposals and received Turner Foundation funding for a national project to educate building professionals and the public on alternative wall systems.
- Researched wall systems in order to document costs, advantages/disadvantages, field experience, qualified manufacturers/installers, and appropriate applications.
- Represented the Institute at trade shows, conferences and workshops.

University of California at Los Angeles, Los Angeles, California ***1994-1995***

Lecturer: The Ecology of Architecture

- Co-taught two six-week courses on sustainable design and construction.
- Developed all lecture discussions and handout materials, and graded all papers for class sizes of roughly 35 adult students.

Syndesis, Inc., Santa Monica, CA ***1994-1995***

Environmental Building Consultant and Project Manager

- Directed environmental building aspects of an “environmental showcase home” including specifying materials, preparing reports, acquiring material donations from manufacturers, and creating promotional materials (project published in numerous trade journals).

- Initiated and managed a customer service, installation, and repair department for the architectural precast concrete materials division of the firm. Managed sales, customer service, contracts, installations, and a crew of six.

Financial Energy Management, Inc., Denver, Colorado ***1993-1994***

Project Manager

- Managed installations of retrofit energy efficiency equipment on a large hospital and smaller commercial buildings. Managed a crew of eight and all client contact.
- Managed contract with a local utility for an electric-to-gas heating unit conversion rebate program by selling program to homeowners, distributing rebate moneys, metering equipment pre- and post-retrofit, and maintaining contact with utility representatives.
- Prepared numerous requests for proposals (RFPs) to utilities nationwide.

Applied Design, Inc., Frey Electric, Bethlehem, Pennsylvania ***1985-1990***

Architectural Woodworker, Residential/Light Commercial Remodeler, Electrician

- Apprenticed in designing and building architectural details for historic buildings.
- Remodeled numerous light commercial and residential buildings (framing, drywall, tile/marble, painting and electrical).

SPECIALIZED TRAINING

- EPA Indoor Air Quality training (Asthma and Allergen Control)

PROFESSIONAL AFFILIATIONS

- American Institute for Learning, Industry Advisory Council Member
- Texas Capitol Area Builders Association, Associate Member
- Sustainable Building Coalition, Member
- Straw Bale Association of Texas, Member
- Eco-Rating International, Environmental Building Analyst
- Ca. Energy Commission, Wall Systems Collaborative, former Co-Chair Educ. Committee
- Architects, Designers and Planners for Social Responsibility, Member
- MENSA, Member

EDUCATION

Coursework towards Certificate in Construction Management, 1996-present
Austin Community College, Texas
Master of Art in Public Policy, major in Energy and Environmental Policy
Center for Politics and Economics, 1993
Claremont Graduate University, California
Master of Business Administration, major in International Business and Public Policy
Peter F. Drucker Graduate Management Center, 1993
Claremont Graduate University, California
Bachelor of Art in Economics,1986
Moravian College, Pennsylvania
Coursework towards Bachelor of Art in Economics, 1981-1983
Swarthmore College, Pennsylvania

Maureen T. Scanlon, P.E., C.E.M.
Engineer

Green Building Program

Contact Information:
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email: maureen.scanlon@austinenergy.com

PROFESSIONAL EXPERIENCE

City of Austin, Austin Energy Services, Austin, Texas ***1996-Present***

Engineer, Commercial Green Building Program

- Works directly with Commercial Green Building clients and other building professionals to find best practice, sustainable, design solutions.
- Recommends and facilitates integrated design methods and processes from the project programming stage through commissioning and building occupancy.
- Uses modeling of buildings at each stage of the design to explore the integrated interaction of building envelope, HVAC, and lighting decisions and to identify cost effective design strategies.
- Provides design assistance and reviews contract documents.
- Continuously researches and evaluates standard, historic, and new technologies.

City of Austin, Environmental and Conservation Services Department,
|Austin, Texas ***1993-1996***

Engineer, Energy Conservation Programs

- Implemented energy conservation/ Demand Side Management (DSM) programs.
- Evaluated new technologies and services for all Energy Services programs.
- Provided direct energy engineering technical assistance to municipal, commercial and residential customers.
- Provided engineering support for all City of Austin energy incentive programs.
- Performed on site evaluation of facility energy using systems.
- Performed airtightness and distribution evaluations for residential and small commercial HVAC systems.
- Co-editor “Guidelines for a Sustainable New Austin Airport”.
- Co-editor “City of Austin Sustainable Building Guidelines Volumes I, II, and III”.
- Co-editor City of Austin Energy Code.
- Developed the “Commercial Energy Code Compliance Workbook” for the City of Austin.

Texas Parks and Wildlife Department, Austin, Texas ***1985-1993***

Mechanical Engineer, Development & Construction Branch of Public Lands Division

- Design and manage repair and capital improvement projects for Department facilities. Project budgets range from $3,500 to $500,000. Facilities include recreational parks; administrative buildings; fish hatcheries; historic sites; and wildlife facilities. Duties include: define the scope of work; estimate the required project budget; design solutions using sound engineering practices and the assistance of other design professionals as necessary; prepare construction documents for bidding; interact with contractor; responsible for all correspondence and contract management; project management and site inspections; represent the Department through the warranty period.
- Design mechanical systems for new development projects and projects requiring a multi-discipline design team. Project budgets range from $200,000 to $4,000,000.
- Systems designed include: HVAC, plumbing, water/ waste water, solar water heating, swimming pools.

SPECIALIZED TRAINING

- Energy Manager Training
- Duct and Building Airtightness Training
- Energy Auditor Training
- Certified Energy-Efficiency Rating Training
- Energy Accounting
- Elite software training for RHVAC & Audit
- IES Lighting School
- Stand Alone Photovoltaic Systems
- Texas Sustainable Building Professional Training Seminar Series “Climatic Design and Daylighting”, “Efficient HVAC”, “Indoor Air quality and Building Commissioning”
- Model Energy Code software training
- EPA Indoor Air Quality Training
  - Orientation to IAQ
  - Asthma and Allergen Control

PROFESSIONAL AFFILIATIONS

- Registered Professional Engineer (Texas License number 70613)
- Certified Energy Manager
- EPA Green Lights Surveyor Ally
- Certified Energy Rater (FSEC State of Florida)
- Association of Energy Engineers, local and national member
- Texas Solar Energy Society, member
- American Solar Energy Society, member
- Sustainable Building Coalition, member

EDUCATION

Bachelor of Science in Mechanical Engineering, 1985
The University of Texas at Austin

Richard Morgan
Program Manager

Contact Information:
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721 Barton Springs Road
Austin, Texas 78704

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Fax: (512) 505-3711
email: richard.morgan@austinenergy.com

PROFESSIONAL EXPERIENCE

City of Austin, Austin Energy Services, Austin, Texas ***1998-Present***

Acting Program Manager, Green Building Program

- Manage day to day operations of the City of Austin Green Building Program.
- Market to and consult with home builders and the public on energy and resource efficient building designs, materials and techniques.

American Institute for Learning, Austin, Texas ***1993-1998***

Construction Programs Manager

- Member of start-up team and manager of Casa Verde Builders from inception until November 1998. Casa Verde Builders is an award-winning construction training program which works with young people to build energy and resource efficient, affordable homes in East Austin.
- Developed concept for and managed AIL/Green Builders from inception to November 1998.
- Managed grant from U.S. Dept. of Energy to teach energy and resource efficient construction practices to affordable housing providers in St. Louis, Missouri and St. Petersburg, Florida, 1998.
- Managed grant from U.S. Dept. of Energy to adapt Casa Verde construction practices to other climatic areas of Texas. Supervised production of manual and webpage detailing the work on this grant. Implemented training program for statewide group of affordable housing providers based on these materials, 1997.
- Organized tour of sustainable, affordable housing built by Casa Verde builders for Texas Natural Resources Conservation Commission's annual Recycling Conference, 1997-98.
- Developed and presented training on sustainable construction practices for H.U.D. Youthbuild programs nationwide, 1996-97.
- Managed grant from Texas State Energy Conservation Office to teach sustainable construction practices to providers of affordable housing statewide. Produced video and manual explaining basic how to's of sustainable construction practices, 1996.
- Created and delivered presentations on sustainable construction, at risk youth and affordable housing for the International Green Building Conference in Austin, Texas, 1994-97.

Austin Habitat for Humanity, Austin, Texas ***1992-1993***

Construction Manager

- Supervised volunteers in the construction of affordable housing. Implemented new energy and resource efficient construction practices at Austin HFH.

Morgan Carpentry and Woodworking, San Francisco, California ***1986-1992***

Principal

- Operated remodeling company and cabinet shop in San Francisco.

SPECIALIZED TRAINING

- **Certified Housing Development Finance Professional**
  National Development Council
  Washington D.C., Awarded June 1996
- **National Service Executive Program**
  Presidio of San Francisco, 1996
- **H.U.D. Youthbuild Management Institute**
  Boston, MA, 1994-95

EDUCATION

German Language Studies
Dolmetscher Institute
Munich, Germany 1975-76

Arabic Language Studies
Defense Language Institute
Presidio of Monterey, CA graduated 1970

PRESENTATIONS

- *Sustainable Construction in Affordable Housing.* Energy Efficient Builders Association annual conference Dallas, Texas. Also presented in Houston, El Paso, and Austin.
- *Energy and Resource Efficient Construction Practices for YouthBuild Programs.* U.S. Department of H.U.D.-sponsored YouthBuild construction conferences in Austin, Texas; St. Petersburg, Florida; and Seattle, Washington.

Lee Gros
Project Manager/ Architect

Green Building Program

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email: lee.gros@austinenergy.com

PROFESSIONAL EXPERIENCE

City of Austin, Austin Energy Services, Austin, Texas ***1999-Present***

Project Manager/Architect, Commercial Green Building Program

- Coordinate Commercial Green Building Program and support Green Building education and marketing to architects and designers.
- Develop a Green Building Program database.
- Create and deliver presentations on sustainable design and the Green Building Program.
- Provide technical consulting services to design and building professionals.

General Services Commission/State Energy Conservation Office, Austin, Texas ***1996-1999***

Program Manager/Architect V

- Responsible for planning, coordination, implementation and administration of sustainability services for school demonstration projects.
- Assist in activities related to sustainability in new construction of state facilities.
- Coordinate all activities related to energy efficiency services for school districts, hospitals, and local governments.
- Manage activities of consulting engineers.
- Prepare, review, and present material for energy management training sessions.
- Perform construction monitoring activities.

General Services Commission, Austin, Texas ***1993-1996***

Program Manager/Architect V

- Responsible for planning, coordination, implementation, and administration of energy conservation measures for the Capitol complex.
- Provide assistance to the energy manager and building maintenance division staff in the long term sustainability of energy conservation measures.
- Assist in planning and development of long range energy conservation goals and master plan.

Governor's Energy Office, Austin, Texas ***1989-1993***

Program Manager

- Developed and managed State energy conservation programs, including the State energy conservation design standard for new State buildings, the energy intern program, and energy manager placement and training in State agencies.
- Represented the Governor's Energy Office and provided guidance as a member of the advisory committee for the biennial symposium on improving building systems.
- Served as a member of the advisory committee for Texas Energy Education Development.
- Successfully managed the design review of the Capitol Preservation and Extension Project for optimization of energy efficiency and secured funding through LoanSTAR for over $2.5 million in energy conservation projects.

Graeber, Simmons & Cowan, AIA Architects, Austin, Texas ***1988-1989***
Assistant Manager, Construction Contract Administration
- Responsible for providing full time on-site project representation for the fast-track construction of a 60,000 sq.ft. Class 100 Clean Room and 170,000 sq.ft. mechanical and laboratory support space for the Sematech Consortium.

Lee Gros, Architect, Austin, Texas ***1986-1987***
Architectural Consultant
- Responsible for the design and coordination of construction documents for the communications and security system for an 800,000 sq.ft. Convention Center for the City of Tampa, Florida.
- Provided building design, construction management, and building analysis services.

City of Austin, Office of Land Development Services, Austin, Texas ***1986-1986***
Process Manager
- Responsible for the identification of problem areas in the development review process and recommendation of revisions necessary to facilitate smooth processing.
- Functioned as a liaison with the public and city staff to resolve conflicting requirements between departments.

Robert Jackson, Architects, Austin, Texas ***1984-1986***
Project Manager
- Responsible for coordination of the Austin System Center, a $25 million, 200,000 sq.ft. office, research, and manufacturing facility for Schlumberger Well Services. Provided complete construction administration including extensive on-site project representation.

James Design Associates, Austin, Texas ***1981-1984***
Associate Partner
- Responsible for the overall office management, field and office construction contract administration services, coordination with clients and municipal agencies, and production management for projects ranging through $5 million.

Tackett, Way, Lodbolz, Houston, Texas ***1979-1981***
Project Architect
- Responsible for all phases of construction documents for commercial, industrial, religious, and residential projects ranging up to $3 million. Strong emphasis on passive solar and daylighting for office and residential projects.

SPECIALIZED TRAINING
- Designing Low-Energy Buildings Workshop featuring Energy-10 software
- Texas Sustainable Building Professional Training Seminars, 1997

PROFESSIONAL AFFILIATIONS
Texas Board of Architectural Examiners, Registered Architect

EDUCATION
Bachelor of Architecture, 1978
University of Houston

Appendix F: LEED Rating System Checklist

LEED™

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Rating System

Version 2.0

Including the Project Checklist

June 2001

Disclaimer

The LEED™ Green Building Rating System 2.0 was developed by the U.S. Green Building Council, under contract number DE-FG36-97GO10268, for the U.S. Department of Energy, Energy Efficiency and Renewable Energy, Office of Building Technology, State, and Community Programs, and are intended for use by commercial building project stakeholders or project team members as a guide for green and sustainable design. They were prepared with the assistance and participation of representatives from many organizations. The views and opinions expressed represent general consensus and available information, but unanimous approval by all organizations is not implied. The views and opinions expressed also do not necessarily state or reflect those of the United States government.

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Project Checklist

Sustainable Sites

14 Possible Points

Y			Prereq 1	**Erosion & Sedimentation Control**	Required
Y	?	N	Credit 1	**Site Selection**	1
Y	?	N	Credit 2	**Urban Redevelopment**	1
Y	?	N	Credit 3	**Brownfield Redevelopment**	1
Y	?	N	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
Y	?	N	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Y	?	N	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
Y	?	N	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
Y	?	N	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
Y	?	N	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
Y	?	N	Credit 6.1	**Stormwater Management**, Rate or Quantity	1
Y	?	N	Credit 6.2	**Stormwater Management**, Treatment	1
Y	?	N	Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, NonRoof	1
Y	?	N	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
Y	?	N	Credit 8	**Light Pollution Reduction**	1

Water Efficiency

5 Possible Points

Y	?	N	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Y	?	N	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
Y	?	N	Credit 2	**Innovative Wastewater Technologies**	1
Y	?	N	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
Y	?	N	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Energy & Atmosphere

17 Possible Points

Y			Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
Y	?	N	Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
Y	?	N	Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
Y	?	N	Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
Y	?	N	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
Y	?	N	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
Y	?	N	Credit 2.1	**Renewable Energy**, 5%	1
Y	?	N	Credit 2.2	**Renewable Energy**, 10%	1
Y	?	N	Credit 2.3	**Renewable Energy**, 20%	1
Y	?	N	Credit 3	**Additional Commissioning**	1
Y	?	N	Credit 4	**Ozone Depletion**	1
Y	?	N	Credit 5	**Measurement & Verification**	1
Y	?	N	Credit 6	**Green Power**	1

Materials & Resources

13 Possible Points

Y			Prereq 1	**Storage & Collection of Recyclables**	Required
Y	?	N	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
Y	?	N	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
Y	?	N	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
Y	?	N	Credit 2.1	**Construction Waste Management**, Divert 50%	1
Y	?	N	Credit 2.2	**Construction Waste Management**, Divert 75%	1
Y	?	N	Credit 3.1	**Resource Reuse**, Specify 5%	1
Y	?	N	Credit 3.2	**Resource Reuse**, Specify 10%	1
Y	?	N	Credit 4.1	**Recycled Content**, Specify 25%	1
Y	?	N	Credit 4.2	**Recycled Content**, Specify 50%	1
Y	?	N	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
Y	?	N	Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
Y	?	N	Credit 6	**Rapidly Renewable Materials**	1
Y	?	N	Credit 7	**Certified Wood**	1

Indoor Environmental Quality

15 Possible Points

Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
Y	?	N	Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
Y	?	N	Credit 2	**Increase Ventilation Effectiveness**	1
Y	?	N	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
Y	?	N	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
Y	?	N	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
Y	?	N	Credit 4.2	**Low-Emitting Materials**, Paints	1
Y	?	N	Credit 4.3	**Low-Emitting Materials**, Carpet	1
Y	?	N	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
Y	?	N	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
Y	?	N	Credit 6.1	**Controllability of Systems**, Perimeter	1
Y	?	N	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
Y	?	N	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
Y	?	N	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
Y	?	N	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
Y	?	N	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process

5 Possible Points

Y	?	N	Credit 1.1	**Innovation in Design**: Specific Title	1
Y	?	N	Credit 1.2	**Innovation in Design**: Specific Title	1
Y	?	N	Credit 1.3	**Innovation in Design**: Specific Title	1
Y	?	N	Credit 1.4	**Innovation in Design**: Specific Title	1
Y	?	N	Credit 2	**LEED™ Accredited Professional**	1

Project Totals

69 Possible Points

☐ ☐ ☐ **Certified** 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

Sustainable Sites

SS | WE | EA | MR | EQ | ID
Prerequisite 1

Prerequisite 1 **Erosion & Sedimentation Control** Required

Intent

Control erosion to reduce negative impacts on water and air quality.

Requirement

Prerequisite 1.0 Design to a site sediment and erosion control plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-832-R-92-005, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:

- Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.

- Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.

Technologies & Strategies

Adopt an erosion and sedimentation control plan for the project site during construction. Consider employing strategies such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps, and sediment basins.

1 Point

Credit 1 **Site Selection**

Intent

Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

Requirement

Credit 1.0 (1 point) Do not develop buildings on portions of sites that meet any one of the following criteria:

-Prime farmland as defined by the American Farmland Trust

-Land whose elevation is lower than **5 feet above** the elevation of the 100-year flood as defined by FEMA

-Land which provides habitat for any species on the Federal or State threatened or endangered list

-Within **100 feet** of any wetland as defined by 40 CFR, Parts 230-233 and Part 22, OR as defined by local or state rule or law, whichever is more stringent

-Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (Park Authority projects are exempt)

Technologies & Strategies

During the site selection process, give preference to those sites that do not include sensitive site elements and restricted land types. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck under parking, and sharing facilities with neighbors.

Credit 2 **Urban Redevelopment** 1 Point

Intent

Channel development to urban areas with existing infrastructures, protecting greenfields and preserving habitat and natural resources.

Requirement

Credit 2.0 (1 point) Increase localized density to conform to existing or desired density goals by utilizing sites that are located within an existing minimum development density of **60,000 square feet per acre** (2 story downtown development)

Technologies & Strategies

During the site selection process, give preference to urban sites with high development densities. Quantify the development density of the project as well as the surrounding area.

1 Point

Credit 3 **Brownfield Redevelopment**

Intent

Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

Requirement

Credit 3.0 (1 Point) Develop on a site classified as a Brownfield and provide remediation as required by EPA's Sustainable Redevelopment of Brownfields Program requirements

Technologies & Strategies

During the site selection process, give preference to brownfield sites. Identify tax incentives and property cost savings by selecting a brownfield site. Adopt a site remediation plan and cleanup the site using remediation strategies such as pump-and-treat, bioreactors, land farming, and in-situ remediation.

Credit 4 **Alternative Transportation** 1-4 Points

Intent

Reduce pollution and land development impacts from automobile use.

Requirements

Credit 4.1 (1 point) Locate building within **½ mile** of a commuter rail, light rail or subway station or **¼ mile** of 2 or more bus lines

Credit 4.2 (1 point) Provide suitable means for securing bicycles, with convenient changing/shower facilities for use by cyclists, for **5%** or more of building occupants

Credit 4.3 (1 point) Install alternative-fuel refueling station(s) for **3%** of the total vehicle parking capacity of the site. Liquid or gaseous fueling facilities must be separately ventilated or located outdoors

Credit 4.4 (1 point) Size parking capacity not to exceed minimum local zoning requirements AND provide preferred parking for carpools or van pools capable of serving **5%** of the building occupants, OR, add no new parking for rehabilitation projects AND provide preferred parking for carpools or van pools capable of serving **5%** of the building occupants.

Technologies & Strategies

Perform a transportation survey of future building occupants to identify transportation needs. Site the building near mass transit and design the building with transportation amenities such as bicycle racks and showering/changing facilities, alternative fuel refueling stations, and carpool/ van pool programs. Also consider sharing transportation facilities such as parking lots and refueling stations with neighbors.

1-2 Points

Credit 5 **Reduced Site Disturbance**

Intent

Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirements

Credit 5.1 (1 point) On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to **40 feet** beyond the building perimeter, **5 feet** beyond primary roadway curbs, walkways, and main utility branch trenches, and **25 feet** beyond pervious paving areas that require additional staging areas in order to limit compaction in the paved area; OR, on previously developed sites, restore a minimum of **50%** of the remaining open area by planting native or adapted vegetation.

Credit 5.2 (1 point) Reduce the development footprint (including building, access roads and parking) to exceed the local zoning's open space requirement for the site by **25%**.

Technologies & Strategies

Perform a site survey to identify site elements and adopt a master plan for development of the project site. Select a suitable building location and design the building with the minimal footprint to minimize site disruption. Strategies include stacking the building program, tuck under parking, and sharing facilities with neighbors. Establish clearly marked construction boundaries to minimize disturbance of existing site and restore previously degraded areas to their natural state.

Credit 6 **Stormwater Management** 1-2 Points

Intent

Limit disruption of natural water flows by minimizing stormwater runoff, increasing on-site infiltration and reducing contaminants.

Requirements

Implement a stormwater management plan that results in:

Credit 6.1 (1 point) **No net increase** in the rate and quantity of stormwater runoff from existing to developed conditions; OR, if existing imperviousness is greater than **50%**, implement a stormwater management plan that results in a **25%** decrease in the rate and quantity of stormwater runoff.

Credit 6.2 (1 point) Treatment systems designed to remove **80%** of the average annual post development total suspended solids (TSS), and **40%** of the average annual post development total phosphorous (TP), by implementing Best Management Practices (BMPs) outlined in EPA's Guidance Specifying Management Measures for Sources of Non-point Pollution in Coastal Waters (EPA 840-B-92-002 1/93).

Technologies & Strategies

Design the project site to maintain natural stormwater flows by promoting infiltration. Specify garden roofs and pervious paving to minimize impervious surfaces. Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing, and custodial uses. Install mechanical or natural treatment systems such as constructed wetlands, vegetated filter strips, and bioswales to treat stormwater volumes leaving the site.

1-2 Points

Credit 7 **Landscape and Exterior Design to Reduce Heat Islands**

Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Requirements

Credit 7.1 (1 point) Provide shade (within 5 years) on at least **30%** of non-roof impervious surface on the site, including parking lots, walkways, plazas, etc., OR, use light-colored/high-albedo materials (reflectance of at least 0.3) for **30%** of the site's non-roof impervious surfaces, OR place a minimum of **50%** of parking space underground OR use open-grid pavement system (net impervious area of LESS than 50%) for a minimum of **50%** of the parking lot area.

Credit 7.2 (1 point) Use ENERGY STAR Roof-compliant, high-reflectance AND high emissivity roofing (initial reflectance of at least 0.65 and three-year-aged reflectance of **at least 0.5** when tested in accordance with ASTM E903 and emissivity of **at least 0.9** when tested in accordance with ASTM 408) for a minimum of **75%** of the roof surface; OR, install a "green" (vegetated) roof for at least **50%** of the roof area.

Technologies & Strategies

Shade constructed surfaces on the site with landscape features and minimize the overall building footprint. Consider replacing constructed surfaces (i.e., roof, roads, sidewalks, etc.) with vegetated surfaces such as garden roofs and open grid paving or specify light-colored, high-albedo materials to reduce the heat absorption.

Credit 8 **Light Pollution Reduction** 1 Point

Intent

Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

Requirement

Credit 8.0 (1 point) Do not exceed Illuminating Engineering Society of North America (IESNA) footcandle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments, AND design interior and exterior lighting such that zero direct-beam illumination leaves the building site.

Technologies & Strategies

Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Minimize site lighting where possible and model the site lighting using a computer model. Technologies to reduce light pollution include full cutoff luminaries, low-reflectance surfaces, and low-angle spotlights.

SS **WE** EA MR EQ ID

Credit 1

Water Efficiency

1-2 Points

Credit 1 **Water Efficient Landscaping**

Intent

Limit or eliminate the use of potable water for landscape irrigation.

Requirements

Credit 1.1 (1 point) Use high efficiency irrigation technology, OR, use captured rain or recycled site water, to reduce potable water consumption for irrigation by **50%** over conventional means.

Credit 1.2 (1 point) Use only captured rain or recycled site water for an additional **50%** reduction (**100% total reduction**) of potable water for site irrigation needs, OR, do not install permanent landscape irrigation systems.

Technologies & Strategies

Perform a soil/climate analysis to determine appropriate landscape types and design the landscape with indigenous plants to reduce or eliminate irrigation requirements. Use high efficiency irrigation systems and consider reuse of stormwater or graywater volumes for irrigation.

Credit 2 **Innovative Wastewater Technologies** 1 Point

Intent

Reduce the generation of wastewater and potable water demand, while increasing the local aquifer recharge.

Requirement

Credit 2.0 (1 point) Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of **50%**, OR, treat **100%** of wastewater on site to tertiary standards.

Technologies & Strategies

Estimate the wastewater volumes generated in the building and specify high efficiency fixtures and dry fixtures such as composting toilets and waterless urinals to reduce these volumes. Consider reusing stormwater or graywater for sewage conveyance or on-site wastewater treatment systems (mechanical or natural).

1-2 Points

Credit 3 **Water Use Reduction**

Intent

Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirement & Submittals

Credit 3.1 (1 point) Employ strategies that in aggregate use **20%** less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

Credit 3.2 (1 point) Exceed the potable water use reduction by an additional **10%** (**30%** total efficiency increase).

Technologies & Strategies

Estimate the potable and non-potable water needs for the building. Use high efficiency fixtures, dry fixtures such as composting toilets and waterless urinals, and occupant sensors to reduce the potable water demand. Consider reuse of stormwater and graywater for non-potable applications such as toilet and urinal flushing, mechanical systems, and custodial uses.

Energy & Atmosphere

SS | WE | **EA** | MR | EQ | ID

Prerequisite 1

Prerequisite 1 **Fundamental Building Systems Commissioning** Required

Intent

Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

Requirement

Prerequisite 1.0 Implement the following fundamental best practice commissioning procedures:

-Engage a commissioning authority

-Review design intent and basis of design documentation

-Include commissioning requirements in the construction documents

-Develop and utilize a commissioning plan

-Verify installation, functional performance, training and documentation

-Complete a commissioning report

Technologies & Strategies

Engage a commissioning authority and adopt a commissioning plan. Include commissioning requirements in bid documents and task the commissioning agent to produce a commissioning report once commissioning activities are completed.

Required

Prerequisite 2 **Minimum Energy Performance**

Intent

Establish the minimum level of energy efficiency for the base building and systems.

Requirement

Prerequisite 2.0 Design to meet building energy efficiency and performance as required by ASHRAE/IESNA 90.1-1999 or the local energy code, whichever is the more stringent.

Technologies & Strategies

Design the building envelope and building systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost effective energy efficiency measures. Quantify energy performance as compared to a baseline building.

Prerequisite 3 **CFC Reduction in HVAC&R Equipment** Required

Intent

Reduce ozone depletion.

Requirement

Prerequisite 3.0 **Zero use** of CFC-based refrigerants in new building HVAC&R base building systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phaseout conversion.

Technologies & Strategies

When reusing existing HVAC systems, conduct an inventory to identify equipment that uses CFC refrigerants and adopt a replacement schedule for these refrigerants. For new buildings, specify new HVAC equipment that uses no CFC refrigerants.

2-10 Points

Credit 1 **Optimize Energy Performance**

Intent

Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

Requirements

Reduce design energy cost compared to the energy cost budget for regulated energy components described in the requirements of ASHRAE/IESNA Standard 90.1-1999, as demonstrated by a whole building simulation using the Energy Cost Budget Method described in Section 11:

New Buildings	Existing Buildings	Points
20%	**10%**	2
30%	**20%**	4
40%	**30%**	6
50%	**40%**	8
60%	**50%**	10

Regulated energy components include HVAC systems, building envelope, service hot water systems, lighting and other regulated systems as defined by ASHRAE.

Credit 1.1 (2 points) Reduce design energy cost by **20%** / **10%**.
Credit 1.2 (4 points) Reduce design energy cost by **30%** / **20%**.
Credit 1.3 (6 points) Reduce design energy cost by **40%** / **30%**.
Credit 1.4 (8 points) Reduce design energy cost by **50%** / **40%**.
Credit 1.5 (10 points) Reduce design energy cost by **60%** / **50%**.

Technologies & Strategies

Design the building envelope and building systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost effective energy efficiency measures. Quantify energy performance as compared to a baseline building.

Credit 2 **Renewable Energy** 1-3 Points

Intent

Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

Requirements

Supply a net fraction of the building's total energy use (as expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

% Total Energy Load Cost in Renewables	Points
5%	1
10%	2
20%	3

Credit 2.1 (1 points) Renewable energy, **5%** contribution

Credit 2.2 (2 points) Renewable energy, **10%** contribution

Credit 2.3 (3 points) Renewable energy, **20%** contribution

Technologies & Strategies

Assess the project for renewable energy potential including solar, wind, geothermal, biomass, hydro, and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

1 Point

Credit 3 **Additional Commissioning**

Intent

Verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.

Requirement

Credit 3.0 (1 point) In addition to the Fundamental Building Commissioning prerequisite, implement the following additional commissioning tasks:

1. Conduct a focused review of the design prior to the construction documents phase.

2. Conduct a focused review of the Construction Documents when close to completion.

3. Conduct a selective review of contractor submittals of commissioned equipment. (The above three reviews must be performed by a firm other than the designer.)

4. Develop a recommissioning management manual.

5. Have a contract in place for a near-warranty end or post occupancy review.

Technologies & Strategies

Engage the Commissioning Authority early in project design phases. Task the commissioning agent to conduct project reviews before and after construction documents are complete. The Commissioning Agent must also create a recommissioning manual for the building and review the project at near-warranty end.

Credit 4 **Ozone Depletion** 1 Point

Intent

Reduce ozone depletion and support early compliance with the Montreal Protocol.

Requirement

Credit 4.0 (1 point) Install base building level HVAC and refrigeration equipment and fire suppression systems that do not contain HCFC's or Halon.

Technologies & Strategies

When reusing buildings, inventory existing building systems using refrigerants and fire suppression chemicals and replace those that contain HCFCs or halons. For new buildings, specify refrigeration and fire suppression systems that use no HCFCs or halons.

1 Point

Credit 5 **Measurement & Verification**

Intent

Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

Requirement

Credit 5.0 (1 point) Comply with the long term continuous measurement of performance as stated in Option B: Methods by Technology of the US DOE's International Performance Measurement and Verification Protocol (IPMVP) for the following:

-Lighting systems and controls

-Constant and variable motor loads

-Variable frequency drive (VFD) operation

-Chiller efficiency at variable loads (kW/ton)

-Cooling load

-Air and water economizer and heat recovery cycles

-Air distribution static pressures and ventilation air volumes

-Boiler efficiencies

-Building specific process energy efficiency systems and equipment

-Indoor water risers and outdoor irrigation systems

Technologies & Strategies

Model the energy and water systems to predict savings. Design the building with equipment to measure energy and water performance. Draft a Measurement & Verification Plan to apply during building operation that compares predicted savings to those actually achieved in the field.

Credit 6 **Green Power** 1 Point

Intent

Encourage the development and use of grid-source energy technologies on a net zero pollution basis.

Requirement

Credit 6.0 (1 point) Engage in a two year contract to purchase power generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-e products certification requirements.

Technologies & Strategies

Estimate the energy needs of the building and investigate opportunities to engage in a green power contract with the local utility. Green power is derived from solar, wind, geothermal, biomass, or low-impact hydro sources.

Materials & Resources

Required

Prerequisite 1 **Storage & Collection of Recyclables**

Intent

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirement

Prerequisite 1.0 Provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals.

Technologies & Strategies

Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area. Identify local waste handlers and buyers for glass, plastic, office paper, newspaper, cardboard, and organic wastes. Instruct occupants on building recycling procedures. Consider employing cardboard balers, aluminum can crushers, recycling chutes, and other waste management technologies to further enhance the recycling program.

Credit 1 **Building Reuse** 1-3 Points

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Reuse large portions of existing structures during renovation or redevelopment projects:

Credit 1.1 (1 point) Maintain at least **75%** of existing building structure and shell (exterior skin and framing excluding window assemblies)

Credit 1.2 (1 point) Maintain an additional **25%** (**100%** total) of existing building structure and shell (exterior skin and framing excluding window assemblies)

Credit 1.3 (1 point) Maintain **100%** of existing building structure and shell AND **50%** non-shell (walls, floor coverings, and ceiling systems)

Technologies & Strategies

Consider reuse of existing buildings, including structure, shell, and non-shell elements. Remove elements that pose contamination risk to building occupants and upgrade outdated components such as windows, mechanical systems, and plumbing fixtures. Quantify the extent of building reuse.

1-2 Points

Credit 2 **Construction Waste Management**

Intent

Divert construction, demolition, and land clearing debris from landfill disposal. Redirect recyclable material back to the manufacturing process.

Requirements

Develop and implement a waste management plan, quantifying material diversion by weight. (Remember that salvage may include the donation of materials to charitable organizations such as Habitat for Humanity.)

Credit 2.1 (1 point) Recycle and/or salvage at least **50%** (by weight) of construction, demolition, and land clearing waste

Credit 2.2 (1 point) Recycle and/or salvage an additional **25%** (**75%** total by weight) of the construction, demolition, and land clearing debris

Technologies & Strategies

Establish goals for landfill diversion and adopt a construction waste management plan to achieve these goals. Consider recycling land clearing debris, cardboard, metals, brick, concrete, plastic, clean wood, glass, gypsum wallboard, carpet, and insulation. Designate a specific area on the construction site for recycling and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials.

Credit 3 **Resource Reuse** 1-2 Points

Intent

Extend the life cycle of targeted building materials by reducing environmental impacts related to materials manufacturing and transport.

Requirements

Credit 3.1 (1 point) Specify salvaged or refurbished materials for **5%** of building materials

Credit 3.2 (1 point) Specify salvaged or refurbished materials for **10%** of building materials

Technologies & Strategies

Identify opportunities to incorporate salvage materials into the building design and research potential material suppliers. Consider salvage materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick, and decorative items.

1-2 Points

Credit 4 **Recycled Content**

Intent

Increase demand for building products that have incorporated recycled content materials, therefore reducing the impacts resulting from the extraction of new materials.

Requirements

Credit 4.1 (1 point) Specify a minimum of **25%** of building materials that contain in aggregate, a minimum weighted average of **20%** post-consumer recycled content material, OR, a minimum weighted average **40%** post-industrial recycled content material.

Credit 4.2 (1 point) Specify an additional **25%** (**50%** total) of building materials that contain in aggregate, a minimum weighted average of **20%** post-consumer recycled content material, OR, a minimum weighted average of **40%** post-industrial recycled content material.

Technologies & Strategies

Establish a project goal for recycled content materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed and quantify the total percentage of recycled content materials installed.

Credit 5 **Local/Regional Materials** 1-2 Points

Intent

Increase demand for building products that are manufactured locally, thereby reducing the environmental impacts resulting from their transportation and supporting the local economy.

Requirements

Credit 5.1 (1 point) Specify a minimum of **20%** of building materials that are manufactured* regionally within a radius of 500 miles.

Credit 5.2 (1 point) Of these regionally manufactured materials, specify a minimum of **50%** that are extracted, harvested, or recovered within 500 miles.

* Manufacturing refers to the *final assembly* of components into the building product that is furnished and installed by the tradesmen. For example, if the hardware comes from Dallas, Texas, the lumber from Vancouver, British Columbia and the joist is assembled in Kent, Washington; then the location of the *final assembly* is Kent, Washington.

Technologies & Strategies

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.

1 Point

Credit 6 **Rapidly Renewable Materials**

Intent

Reduce the use and depletion of finite raw, and long-cycle renewable materials by replacing them with rapidly renewable materials.

Requirement

Credit 6.0 (1 point) Specify rapidly renewable building materials for **5%** of total building materials.

Technologies & Strategies

Establish a project goal for rapidly renewable materials and identify materials and suppliers that can achieve this goal. Consider materials such as bamboo flooring, wool carpet, strawboard, cotton batt insulation, linoleum flooring, poplar OSB, sunflower seed board, and wheatgrass cabinetry. During construction, ensure that the specified rapidly renewable materials are installed and quantify the total percentage of rapidly renewable materials installed.

Credit 7 **Certified Wood** 1 Point

Intent

Encourage environmentally responsible forest management.

Requirement

Credit 7.0 (1 point) Use a minimum of **50%** of wood-based materials certified in accordance with the Forest Stewardship Council Guidelines for wood building components including but not limited to structural framing and general dimensional framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers.

Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify products and suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

SS | WE | EA | MR | **EQ** | ID

Prerequisite 1

Indoor Environmental Quality

Required

Prerequisite 1 **Minimum IAQ Performance**

Intent

Establish minimum indoor air quality (IAQ) performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants.

Requirement

Prerequisite 1.0 Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality and approved Addenda.

Technologies & Strategies

Design the HVAC system to meet the ventilation requirements of the reference standard. Identify potential IAQ problems on the site and locate air intakes away from contaminant sources.

Prerequisite 2 **Environmental Tobacco Smoke** (ETS) **Control**

Required

Intent

Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

Requirement

Prerequisite 2.0

Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, provide a designated smoking room designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the nonsmoking area of the building, enclosed with impermeable structural deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of **at least 7 Pa** (0.03 inches of water gauge).

Performance of smoking rooms shall be verified using tracer gas testing methods as described in the ASHRAE Standard 129-1997. Acceptable exposure in nonsmoking areas is defined as **less than 1%** of the tracer gas concentration in the smoking room detectable in the adjoining nonsmoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

Technologies & Strategies

Prohibit smoking in the building or provide separate smoking rooms with isolated ventilation systems.

1 Point

Credit 1 **Carbon Dioxide** (CO_2) **Monitoring**

Intent

Provide capacity for indoor air quality (IAQ) monitoring to sustain long-term occupant health and comfort.

Requirement

Credit 1.0 (1 point) Install a permanent carbon dioxide (CO_2) monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments, AND specify initial operational set point parameters that maintain indoor carbon dioxide levels no higher than outdoor levels by more than 530 parts per million at any time.

Technologies & Strategies

Design the HVAC system with carbon dioxide monitoring sensors and integrate these sensors with the building automation system (BAS).

Credit 2 **Increase Ventilation Effectiveness** 1 Point

Intent

Provide for the effective delivery and mixing of fresh air to support the health, safety, and comfort of building occupants.

Requirement

Credit 2.0 (1 point) For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (E) greater than or equal to **0.9** as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than **90%** of the room or zone area in the direction of air flow for at least **95%** of hours of occupancy.

Technologies & Strategies

Design the HVAC system and building envelope to optimize air change effectiveness. Air change effectiveness can be optimized using a variety of ventilation strategies including displacement ventilation, low-velocity ventilation, plug flow ventilation such as underfloor or near-floor delivery, and operable windows. Test the air change effectiveness of the building after construction.

1-2 Points

Credit 3 **Construction IAQ Management Plan**

Intent

Prevent indoor air quality problems resulting from the construction/renovation process, to sustain long-term installer and occupant health and comfort.

Requirements

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and preoccupancy phases of the building as follows:

Credit 3.1 (1 point) During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, AND protect stored on-site or installed absorptive materials from moisture damage, AND replace all filtration media immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999.

Credit 3.2 (1 point) Conduct a minimum two-week building flush-out with new filtration media at **100%** outside air after construction ends and prior to occupancy, OR conduct a baseline indoor air quality testing procedure consistent with current EPA Protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445.

Technologies & Strategies

Adopt an IAQ management plan to protect the HVAC system during construction, control pollutant sources, and interrupt pathways for contamination. Sequence installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard. Prior to occupancy, perform a two-week building flushout or test the contaminant levels in the building.

Credit 4 **Low-Emitting Materials** 1-4 Points

Intent

Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

Requirements

Meet or exceed VOC limits for adhesives, sealants, paints, composite wood products, and carpet systems as follows:

Credit 4.1 (1 point) Adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 by, AND all sealants used as a filler must meet or exceed Bay Area Air Quality Management District Reg. 8, Rule 51.

Credit 4.2 (1 point) Paints and coatings must meet or exceed the VOC and chemical component limits of Green Seal requirements.

Credit 4.3 (1 point) Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program.

Credit 4.4 (1 point) Composite wood and agrifiber products must contain no added urea-formaldehyde resins.

Technologies & Strategies

Specify low-VOC materials in construction documents. Ensure that VOC limits are clearly stated in each section where adhesives, sealants, paints, coatings, carpet systems, and composite woods are addressed.

1 Point

Credit 5 **Indoor Chemical & Pollutant Source Control**

Intent

Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

Requirement

Credit 5.0 (1 point) Design to minimize cross-contamination of regularly occupied occupancy areas by chemical pollutants: Employ permanent entry way systems (grills, grates, etc.) to capture dirt, particulates, etc. from entering the building at all high volume entry ways, AND provide areas with structural deck to deck partitions with separate outside exhausting, no air recirculation and negative pressure where chemical use occurs (including housekeeping areas and copying/print rooms), AND provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

Technologies & Strategies

Design separate exhaust and plumbing systems for rooms with contaminants to achieve physical isolation from the rest of the building. Install permanent architectural entryway systems such as grills or grates to prevent occupant-borne contaminants from entering the building.

Credit 6 **Controllability of Systems** 1-2 Points

Intent

Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

Requirements

Credit 6.1 (1 point) Provide a minimum of **one** operable window and **one** lighting control zone **per 200 SF** for all occupied areas **within 15 feet** of the perimeter wall.

Credit 6.2 (1 point) Provide controls for each individual for airflow, temperature, and lighting for **50%** of the non-perimeter, regularly occupied areas.

Technologies & Strategies

Design the building with occupant controls for airflow, temperature, and lighting. Strategies to consider include task lighting, operable windows, and underfloor HVAC systems with individual diffusers.

1-2 Points

Credit 7 **Thermal Comfort**

Intent

Provide for a thermally comfortable environment that supports the productive and healthy performance of the building occupants.

Requirements

Credit 7.1 (1 point) Comply with ASHRAE Standard 55-1992, Addenda 1995 for thermal comfort standards including humidity control within established ranges per climate zone.

Credit 7.2 (1 point) Install a permanent temperature and humidity monitoring system configured to provide operators control over thermal comfort performance and effectiveness of humidification and/or dehumidification systems in the building.

Technologies & Strategies

Establish temperature and humidity comfort ranges and design the building envelope and HVAC system to maintain these comfort ranges. Install and maintain a temperature and humidity monitoring system in the building to automatically adjust building conditions as appropriate.

Credit 8 **Daylight & Views** 1-2 Points

Intent

Provide a connection between indoor spaces and outdoor environments through the introduction of sunlight and views into the occupied areas of the building.

Requirement & Submittals

Credit 8.1 (1 point) Achieve a minimum Daylight Factor of **2%** (excluding all direct sunlight penetration) in **75%** of all space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight.

Credit 8.2 (1 point) Direct line of sight to vision glazing from **90%** of all regularly occupied spaces, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas.

Technologies & Strategies

Design the building to maximize daylighting and view opportunities. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior shading devices, high performance glazing, and photo-integrated light sensors. Model daylighting strategies with a physical or computer model to assess footcandle levels and daylight factors achieved.

SS | WE | EA | MR | EQ | **ID**

Credit 1

Innovation & Design Process

1-4 Points

Credit 1 **Innovation in Design**

Intent

To provide design teams and projects the opportunity to be awarded points for exceptional performance above requirements set by the LEED Green Building Rating System™ and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System™.

Requirements

Credit 1.1 (1 point) In writing, using the LEED™ Credit Equivalence process, identify the **intent** of the proposed innovation credit, the proposed **requirement** for compliance, the proposed **submittals** to demonstrate compliance, and the **design approach** used to meet the required elements.

Credit 1.2 (1 point) Same as Credit 1.1.

Credit 1.3 (1 point) Same as Credit 1.1.

Credit 1.4 (1 point) Same as Credit 1.1.

Technologies & Strategies

Substantially exceed a LEED™ performance credit such as energy performance or water efficiency. Apply strategies or measures that are not covered by LEED™ such as acoustic performance, education of occupants, community development, or life-cycle analysis of material choices.

Credit 2 **LEED™ Accredited Professional** 1 Point

Intent

To support and encourage the design integration required by a LEED™ Green Building project and to streamline the application and certification process.

Requirement

Credit 2.0 (1 point) At least one principal participant of the project team that has successfully completed the LEED™ Accredited Professional exam.

Technologies & Strategies

Attend a LEED™ Accredited Professional Training Workshop and successfully pass the LEED™ accreditation exam.